

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL

TRUCK, LIFT, FORK, ELECTRIC

SOLID RUBBER TIRES

4000 POUND CAPACITY

ARMY MODEL MHE-196

BAKER MODEL FTD-040-EE

FSN 3930-709-6342 (100-IN. LIFT)

FSN 3930-709-6341 (130-IN. LIFT)

FSN 3930-709-6358 (144-IN. LIFT)

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY
APRIL 1965

SAFETY PRECAUTIONS

Before Operation

Do not perform any maintenance on the hydraulic system without lowering the lift carriage, tilting the mast fully down, relieving all pressure in the hydraulic unit and disconnecting the battery, unless power is required during maintenance.

Be very careful of flame, smoking, or creating any sparks while charging batteries or working near recently charged batteries. Hydrogen gas is created by batteries and is highly explosive and easily ignited.

Do not perform any maintenance on electrical system without first disconnecting power.

Remove rings, metal watch bands, or other objects which may cause a short circuit while working on electrical components as this can cause serious burns to personnel and damage to equipment.

During Operation

Do not perform any maintenance on the truck without disconnecting all power.

Be very careful of personnel near the area where the truck is being operated as serious injury or even death can occur by careless operation of the truck.

Make sure all loads being carried on the truck are carefully balanced and tied down when carried for long distance or on rough terrain.

After Operation

Park the truck with carriage lowered and mast tilted down.

Do not perform maintenance on the truck without disconnecting all electrical power and relieving pressure in the hydraulic system.

Be very careful of flame, smoking, or creating any sparks while charging batteries or working near recently charged batteries. Hydrogen gas is created by batteries and is highly explosive and easily ignited.

Remove rings, metal watch bands, or other objects which may cause a short circuit while working on electrical components as this can cause serious burns to personnel and damage to equipment.

Changes in Force: C1 and C2

TM 10-3930-257-20
C2

CHANGE }
No. 2 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 7 February 1980

Organizational Maintenance Manual

TRUCK, LIFT, FORK, ELECTRIC, SOLID RUBBER TIRES, 4000 LB CAPACITY, (ARMY MODEL MHE-196, BAKER MODEL FTD-040-EE), NSN 3930-00-709-6342 (100 IN. LIFT), NSN 3930-00-709-6341 (130 IN. LIFT), NSN 3930-00-709-6358 (144 IN. LIFT).

TM 10-3930-257-20, 23 April 1965, is changed as follows:

Page 11. Paragraph 13. Add the following before paragraph 13.

WARNING

Insure that static electricity discharge straps are installed on the forklift truck and are in good condition. Failure to use the straps could result in the generation of a spark which could ignite explosives or flammables.

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25A, Organizational maintenance requirements for Warehouse Equipment.

CHANGE }
No. 1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 26 March 1968

Organizational Maintenance Manual

**TRUCK, LIFT, FORK, ELECTRIC
SOLID RUBBER TIRES, 4000 LB CAPACITY
(ARMY MODEL MHE-196, BAKER MODEL FTD-040-EE)
FSN 3930-709-6342 (100 IN. LIFT)
FSN 3930-709-6341 (130 IN. LIFT)
FSN 3930-709-6358 (144 IN. LIFT)**

TM 10-3930-257-20, 23 April 1965 is changed as follows:

Page 2. Paragraph 4 is superseded as follows:

4. Report of Equipment Publication Improvements
Report of errors, omissions, and recommendations for improving this publication by the individual is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to the Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd, St. Louis, Mo., 63120.

Page 5. In subparagraph 7f, the following entry is added before line 1:

Model..... MS15367

Page 27. In subparagraph 37a, line 2, delete the following: "bolts" (fig. 13).

Page 27, paragraph 37. Subparagraphs 37a, (3), (4) and figure 13 are superseded by new subparagraphs (3), (4), (5), and new figure 13 as follows:

(3) Remove the inspection hole plug and access plug (fig. 13) and turn the wheel until one of the adjusting cams can be seen through the plug hole. Insert a screwdriver and turn the front cam clockwise, or the rear cam counterclockwise, to bring the lining into contact with the brake drum until the wheel drags slightly when it is turned by hand.

Note.

The above instructions on cam turning directions are for the right wheel. Turn cams on left wheel in opposite directions.

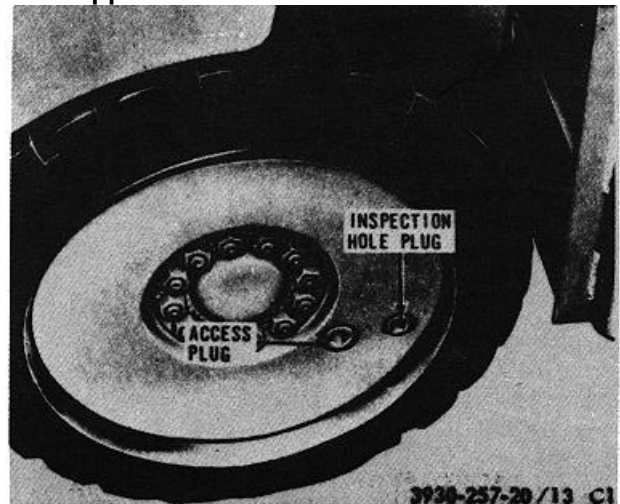


Figure 13. Service brake adjustment.

(4) Back off the cam enough to allow free rotation of the wheel.

(5) Follow the instructions in steps (3) and (4) and adjust the shoes on the other wheel. Make the adjustments as uniform as possible.

By Order of the Secretary of the Army:

Official:

KENNETH G. WICKHAM,
*Major General, United States Army,
The Adjutant General.*

HAROLD K. JOHNSON,
*General, United States Army,
Chief of Staff.*

Distribution:

To be distributed in accordance with DA Form 12-25, Section I, organizational maintenance requirements for Truck, Fork Lift, Electrical.

TECHNICAL MANUAL }
 No. 10-3930-257-20

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 WASHINGTON, D.C., 23 April 1965

Organizational Maintenance Manual
TRUCK, LIFT, FORK, ELECTRIC
SOLID RUBBER TIRES
4,000-POUND CAPACITY
BAKER MODEL FTD-040-EE, ARMY MODEL MHE-196
FSN 3930-709-6342 (100 INCH LIFT)
FSN 3930-709-6341 (130 INCH LIFT)
FSN 3930-709-6358 (144 INCH LIFT)

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TAGO 8340A-750618-May 1965

CHAPTER 1 INTRODUCTION

Section I. GENERAL

1. Scope

These instructions are published for the use of personnel responsible for the organizational maintenance of Truck, Lift, Fork, Electric, Solid Rubber-Tired Wheels, 4,000-Pound Capacity Baker Model FTD-040-EE, Army Model MHE-196, Federal Stock No. 3930-709-6342 (100 inch lift), Federal Stock No. 3930-709-6341 (130 inch lift), and Federal Stock No. 3930-709-6358 (144 inch lift).

2. Appendixes

Appendix I is a list of current references. Appendix II contains the maintenance allocation chart. The repair parts and special tools list authorized for use at organizational level is published in TM 103930-257-20P.

3. Maintenance Forms, Records, and Reports

The maintenance forms, records, and reports to be used in the organizational maintenance of this truck are listed and described in TM 38-750.

4. Reporting of Equipment Manual Improvements

The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvements. This form will be completed using pencil, pen, or typewriter and forwarded direct to Commanding General, U.S. Army Mobility Equipment Center, ATTN: SMOME-MMP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120

5. Orientation

Throughout this manual, the terms *right*, *left*, *front*, and *rear* indicate directions from the viewpoint of the operator sitting in the seat of the truck.

Section II. DESCRIPTION AND DATA

6. Description

a. General. Refer to TM 10-3930-257-10 for a more general description of the truck.

b. Truck. Power for travel, lifting and steering is by a 36 volt battery. The travel system includes a motor, motor controls, and a power axle assembly to provide four speeds forward and reverse. The truck may be equipped with any one of three lift heights. Lifting mechanisms are similar except for certain dimensions for each lift height. The lifting mechanism consists of an electric motor, pump, controls, reservoir, lift and tilt cylinders, mast assembly, and forks. Hydraulic service brakes, and both hand and automatic parking brakes are used. If motor is reversed while

accelerator is depressed, circuit to travel motor is broken. If motor is reversed while traveling in first or in second speed, vehicle will slow down, stop and then reverse.

c. Power Axle and Motor Assembly. The power axle and motor assembly consists of travel motor, coupling, power axle with differential, axle shafts, final drive gears, and wheels. Power is transmitted directly from travel motor through a bevel gear and pinion in the axle, through the axle drive shafts, final drive gear, and wheels.

d. Control System. The travel motor power and vehicle speed and direction are regulated

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by a system which includes a contactor, accelerating switch, directional switch, and resistor providing four speeds forward or reverse. A manually operated directional lever on the directional switch operates the accelerating switch with a circuit made and broken by the contactor. A foot accelerator operates through the accelerating switch to select, in sequence, any one of four speeds. Resistors are used in the travel motor armature circuit to control speed of truck.

e. *Steering System.* The steering system includes a recirculating ball type power steering gear mounted at the front of truck, connecting linkage, steering bellcrank, tie rods, and steering knuckles mounted on trailing axle.

f. *Brake System.* The brake system consists of a mechanical parking brake and a hydraulic foot brake. The mechanical brake operates on a drum on the travel motor armature shaft. This brake is applied either by a handle on the steering column, or automatically through spring action as the driver rises from the seat. The hydraulic brake is a conventional automotive system effective only on the front (drive) wheels.

g. *Mast Assembly.* The mast assembly consists of four main assemblies as follows:

- (1) *Outer upright assembly.* The outer upright assembly is a welded one piece assembly that is mounted on the frame assembly and encloses hoist cylinder and inner upright assembly.
- (2) *Inner upright assembly.* The inner upright assembly is a welded one piece assembly that is mounted within outer upright assembly. The hoist cylinder, mounted in the base of outer upright assembly is secured through the top of inner upright assembly. The inner upright assembly is raised or lowered by action of the hoist cylinder.
- (3) *Crosshead assembly.* The crosshead assembly is mounted over the hoist cylinder. Chains are attached to the lift carriage assembly, roll over the crosshead assembly and are secured to the hoist cylinder. As the cylinder rises,

the crosshead assembly rises, tightening the chains, and raising the lift carriage assembly.

- (4) *Lift carriage assembly.* The lift carriage assembly rides on four rollers within the inner upright assembly, which in turn slides up and down inside of the outer upright channels. Two forks are mounted on the front of the lift carriage assembly for handling of loads.

h. *Lift Hydraulic System.* The hydraulic system consists of a reservoir, pump, control valve, hoist and tilt cylinder, and hydraulic hoses. The hoist cylinder raises the lift carriage and forks by hydraulic pressure supplied by the pump, and lowers them by gravity.

i. *Lift Cylinder.* A compound lift is used on this vehicle. The lift carriage rises to the top of the outer upright before the inner upright together with the lift carriage move upward in the second stage. This is achieved by a dual hydraulic hoist cylinder assembly with two pistons working in sequence.

j. *Tilt Cylinders.* The tilt cylinders are double-acting, the uprights are tilted in and out by hydraulic pressure.

k. *Electrical System.* The electrical system is a two-wire, no-ground type. The battery is connected into the circuit by means of a removable connector. The charging connection is also made through this connector. The weight of the operator in driver's seat closes circuit to the accelerating switch by an interlock switch. Travel control is through the accelerating switch, with circuit made and broken by contactor. The direction of travel is selected by the directional switch lever on the steering gear post. Resistors in the motor armature circuit control speed of truck. The stop and taillight is enclosed in a guard on the rear of truck. The headlight, mounted on the right side of the hoist upright, is controlled by a toggle switch on the instrument housing.

l. *Battery.* The 36-volt battery may be the lead-acid type or nickel-iron-alkaline type. It will weigh approximately 2,300 pounds. It is

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located in the battery compartment and connected into the electrical circuit of the truck by a battery connector. The battery compartment dimensions are 32 15/16 inches long by 39 1/2 inches wide by 25 inches high.

m. Accelerating Switch. The accelerating switch used for controlling truck speed is a pedal operated pilot device to control magnetic contactors which in turn, control the motor of the truck. It provides four individual speeds and has time delay acceleration and plugging control. The accelerating switch is located under the operator's floor plate.

n. Directional Switch. The directional switch selects forward or reverse operation of the travel motor. This switch is a three-position, manually-operated, two-circuit pilot device. The direction switch is located on the steering gear post.

o. Contactors. The magnetic contactors make and break the circuits in response to related manual and automatic controls. These contactors are mounted in the electrical equipment box, inside the cowl.

p. Travel Motor. The travel motor, under the operator's floor plate, is a series wound, direct-current electric motor. Connected to the power axle, it drives truck forward or backward.

q. Hydraulic Pump Motor. The pump motor for the upright hydraulic system is controlled by a switch which closes pump motor contactor. The switch is operated by either lift or tilt controls, starting motor when lever is moved about one-quarter of its travel toward lift or tilt positions. The switch is opened when lever is returned to neutral position. The pump motor is a series wound, direct-current motor and operates hydraulic pump.

r. Steering Pump Motor. The steering pump motor is controlled by a switch which closes circuit when operator is in driver's seat. It is in continuous operation while operator is seated.

s. Resistors. The fixed, tapped resistor which controls truck speed, is located in an enclosed box on the left side of truck. The travel motor controls select as much resistance as required by connecting sections of the resistor in series with the travel motor armature circuit.

t. Hourmeter. The hourmeter is the only instrument used on this truck. This meter automatically records number of hours truck has been in operation.

7. Tabulated Data

a. Electrical System.

Type.....	Type EE, spark enclosed, two-wire, ungrounded.
Voltage	36 volts dc
Battery	Government furnished equipment
Battery compartment dimensions	32 15/16 in. long, 39 1/2 in. wide, 25 in. high
Traveling motor:	
No load draw.....	90 amps
Full load draw	110 amps
Hydraulic pump motor:	
No load draw.....	115 amps
Full load draw	225 amps
Power steering pump motor:	
No load draw.....	18 amps
Full load draw	25 amps

b. Manufacturer's Identification.

Nomenclature.....	Truck, lift, fork, electric
Manufacturer.....	Baker Industrial Trucks, Division of Otis Elevator Company.
Capacity.....	4,000 lbs
Model.....	FTD-040-EE
Contract numbers.....	DSA 019092-MP302, and DSA-4-020841-MP302.

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b. Manufacturer's Identification-Continued.

Service weight 5,700 lbs (add 2,300 lbs for battery)
Wheel load (no load on forks):
 Drive wheels (each) 1,550 lbs
 Steering wheels (each)..... 2,300 lbs
Center of gravity (no load on forks):
 Horizontal 30 in. from axle of drive wheels
 Vertical 16 in. above axle of drive wheels

c. General.

Gross vehicle capacity 4,000 lbs at 24 in. load center
Maximum speed (empty)..... 5.4 mph
Maximum speed (loaded)..... 5.1 mph
Grade ability..... 15 percent with max load

d. Shipping Dimensions.

Length..... 80 in.
Width 42 in.
Height 81 in.
Weight 5,700 lbs without battery

e. Hydraulic System.

Main pump output 7.1 gpm (gallons per minute) at 1,000 psi and 1,200 rpm.
Steering pump output..... 1.5 gpm at 100 psi and 1,200 rpm
Relief pressure (valve) 1,800 psi
Hoist speed (empty) 47 ft per minute
Hoist speed (loaded) 29 ft per minute

f. Battery (Government Furnished Equipment).

Voltage 36 volts
Type..... Lead-Acid or Nickel-Iron
Capacity:
 Lead-Acid 450 amp-hours
 Nickel-Iron 640 amp-hours
Weight (approx):
 Lead-Acid 2300 lbs
 Nickel-Iron 1950 lbs

g. Hydraulic Pump Motor.

Manufacturer..... GE
Type..... BT

h. Control Valve.

Manufacturer..... Parker Hanniflin Company
Model..... VDPIIPD

i. Directional Switch.

Manufacturer..... Square D Company
Type..... CD-2A
Class..... 8963

j. Operating Data.

Turning radius 78 1/2 in.
Actual stacking aisle (48 in. long load).. 140 in.
Maximum stacking aisle (48 in. long..... 142 in.
load).

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SERVICE UPON RECEIPT OF TRUCK

8. General

When a new truck is received by an organization, it must be serviced as described in paragraphs 9 and 10 by organizational maintenance personnel.

9. Removal of Preservatives

a. Remove tape, paper, or other packing. Use extreme care when unpacking and installing separately packaged components.

b. Remove with SD (Solvent, drycleaning) preservative compound from exposed metal surfaces. Because this compound is not a lubricant, take special care to see that it is completely removed from all wearing surfaces.

c. Fill drive axle and hydraulic tank with proper lubricant as indicated in lubrication order (par. 11).

d. Refer truck to direct support maintenance for installation of battery retaining items shipped loose with truck.

10. Maintenance Inspection and Tests

a. The organization mechanic will perform the services and tests that are listed and described in figure 3. The services performed at this time will begin the cycle of regularly scheduled preventive maintenance services.

b. The deficiencies and shortcomings noted, and the corrective action taken will be reported on the appropriate forms prescribed and explained in TM 38-750.

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**CHAPTER 3
MAINTENANCE INSTRUCTIONS**

Section I. LUBRICATION

11. General

Lubrication Order 10-3930-257-20 prescribes lubrication maintenance of the truck; compliance with the instructions is mandatory at all levels of maintenance. The order includes lubrication instructions for normal and abnormal conditions and temperatures. If truck is received without a lubrication order, the using

organization must requisition a lubrication order through normal channels in accordance with AR 310-1.

12. Illustrations

The lubrication order is illustrated in figure 1. The numbers that have been inserted on the border of the illustration refer to specific lubrication points that are pictured in figure 2 and called out by numbers 1 through 20.

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**LUBRICATION
ORDER**

LO 10-3930-257-20

9 APRIL 1965

**TRUCK, LIFT, FORK, ELECTRIC, SOLID RUBBER TIRES, 4,000
LBS CAPACITY, 100 IN LIFT, 130 IN LIFT, AND 144 IN LIFT,
(BAKER MODEL FTD-004-EE, ARMY MODEL MHE 196)**

Reference C9100-3L

Intervals are based on normal hours of operations. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.

Clean fittings before lubricating.

Drain gearcases when hot. Fill and check level.

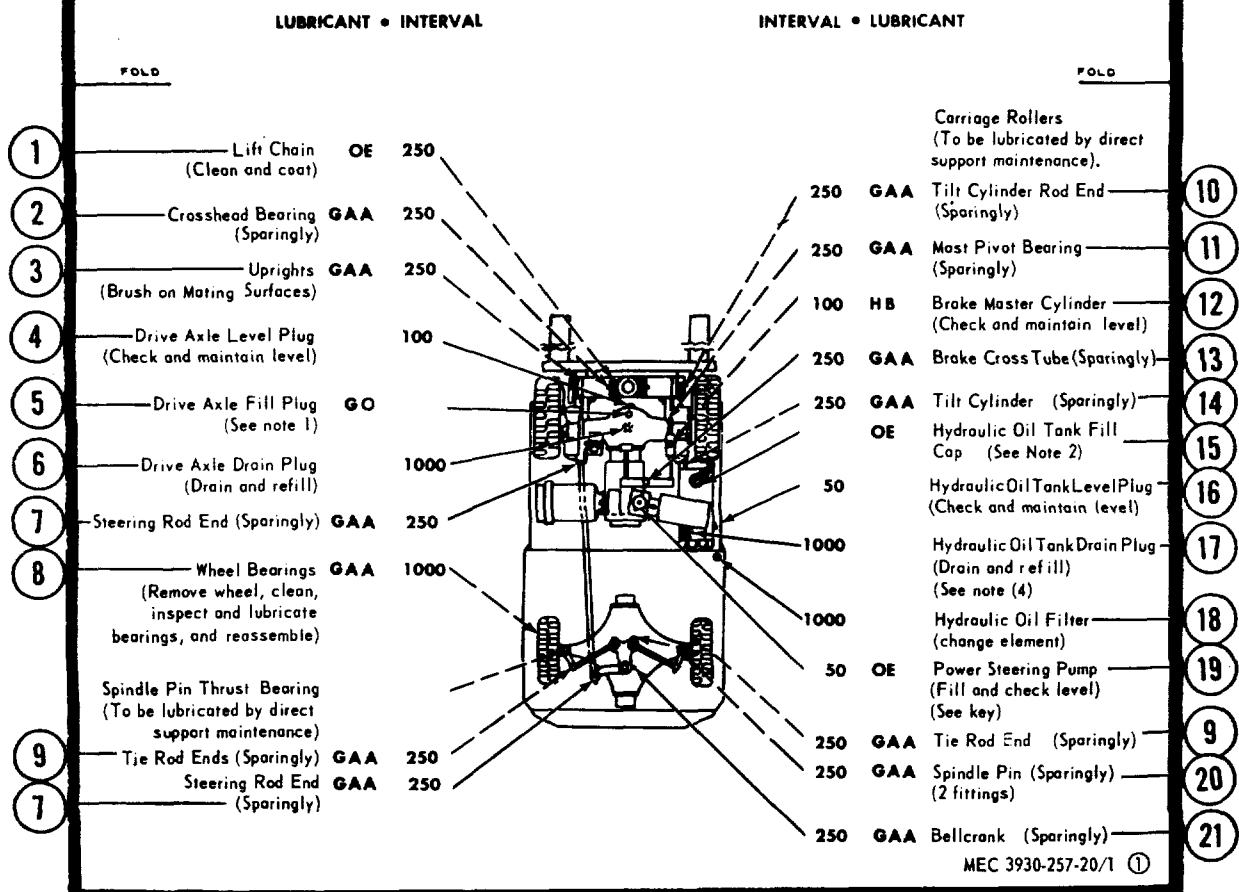


Figure 1. LO 10-3930-257-20.

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- KEY -

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE - Oil, Engine, Heavy Duty		OE 10	OE 10	OES	Intervals given are in hours of normal operation
Power Steering Reservoir	1 qt				
Hydraulic Oil Reservoir	25 qt				
Oil Can Points					
OES - Oil, Engine, Sub-zero		GO 90	GO 90	GOS	
GO - LUBRICATION OIL, Gear, Drive Axle	4-1/2 qt				
GOS - LUBRICATION OIL, Gear, Sub-zero					
HB - HYDRAULIC FLUID, Automotive Master Brake Cylinder		All temperatures			
GAA - GREASE, Automotive and Artillery		All temperatures			

FOLD

FOLD

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10 F. Remove lubricants prescribed in the key for temperatures above 10 F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10 F.
2. HYDRAULIC SYSTEM. After refilling system, operate lift 5 minutes, check level and bring to full mark.
3. OIL CAN POINTS. Every 100 hours lubricate seat brake and hand brake, linkage, accelerate pivots, battery rollers and all adjusting threads with OE.

4. Every 1000 hours, remove access plate, drain hydraulic tank; remove and clean filter screen.

A copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE
SECRETARY OF THE ARMY:

HAROLD K. JOHNSON
General, United States Army,
Chief of Staff.

OFFICIAL:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

MEC 3930-257-20/1 ②

Figure 1 -Continued.

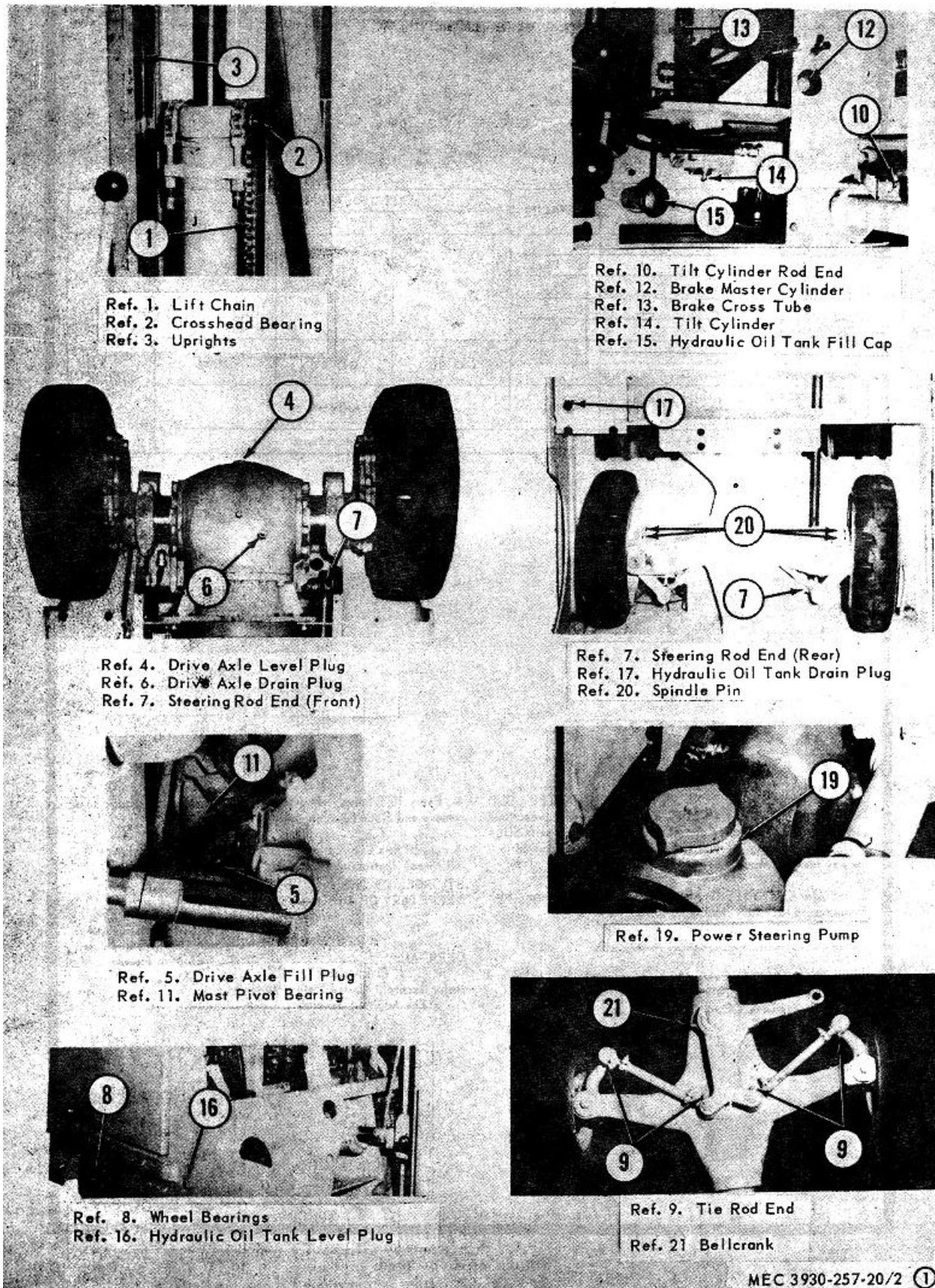


Figure 2. Lubrication points.

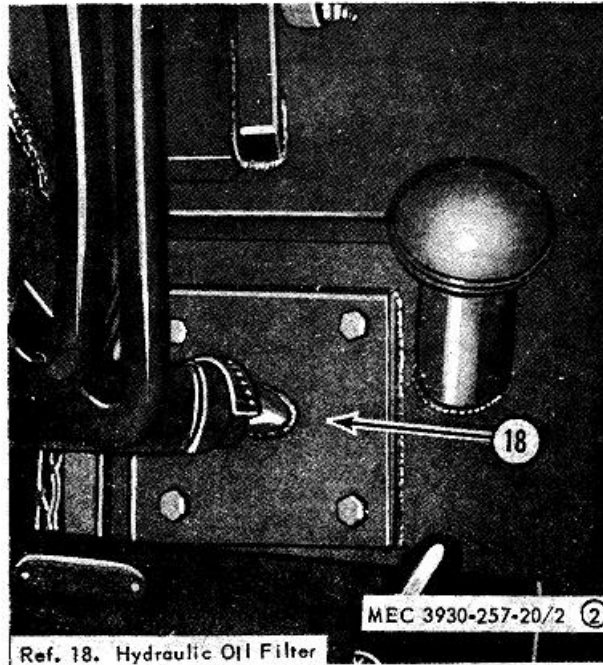


Figure 2-Continued.

Section II. PREVENTIVE MAINTENANCE SERVICES

13. General

To insure that equipment is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed in figure 3, and are described in paragraph 14. The item numbers indicate a convenient sequence in which to perform the inspection. Note minor defects TAGO 8340A

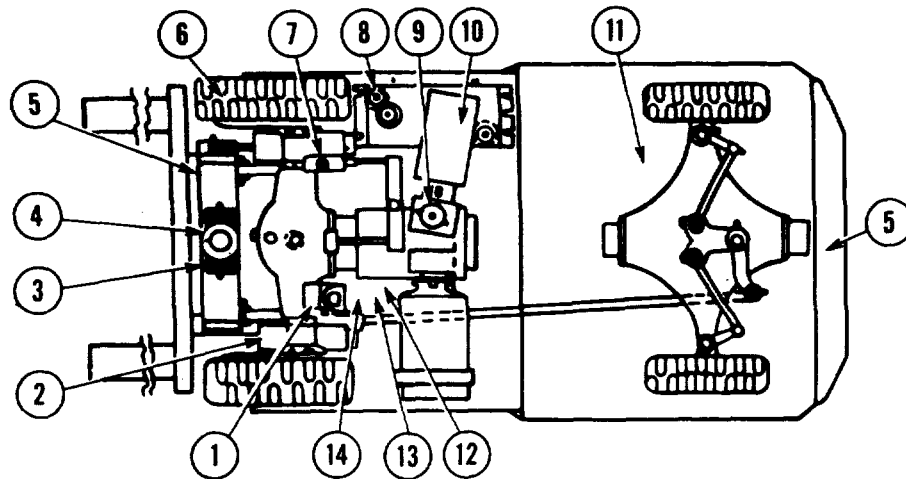
discovered during operation of the forklift truck for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

PREVENTIVE MAINTENANCE SERVICES QUARTERLY

TM10-3930-257-20

BAKER MODEL FTD-040-EE
ARMY MODEL MHE 196

FORK LIFT TRUCK



ITEM	LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER	PAR REF
1	FIRE EXTINGUISHER. Inspect for broken seal. The dry chemical type must be weighed every 6 months. If the weight has decreased to less than 4-1/2 pounds or the pressure is below 125 psi, the extinguisher must be replaced.	
2	TILT CYLINDERS. Check for leaks or damage and for proper adjustment. Uprights will extend evenly when properly adjusted. Tighten loose connections. Tighten packing gland.	
3 3	LIFT LIFT CHAIN. Check for cracked, broken, or excessively worn links. Replace defective links.	
4	LIFT CYLINDER. Check for leaks. Tighten loose connections. Tighten packing nuts.	
5	LIGHTS. Check operation. Replace a defective lamp or lamp unit.	
6	TIRES. Check tires for cuts. Remove foreign material.	
7	BRAKE MASTER CYLINDER. Check master cylinder and lines for leaks and loose connections. Fill to within 1/4 inch of top. Tighten loose connections. Replace leaking master cylinder.	

MEC 3930-257-20/3 (i)

Figure 3. Quarterly preventive maintenance services.

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ITEM		PAR REF
8	OIL TANK. Add fluid as required. Clean or replace a dirty or damaged breather cap. Check filter element. Replace if dirty.	
9	POWER STEERING RESERVOIR. Add fluid as required. Clean venthole in filler cap.	
10	STEERING MOTOR BRUSHES. Check for wear.	
11	BATTERY. Remove corrosion. Add fluid as needed.	
12	BRAKE PEDAL. Check pedal for travel. Adjust if necessary. Pressure should increase after 1/4 to 1/2 inch travel.	
13	HORN. Check operation. Replace defective horn.	
14	CONTROLS. Check controls for proper operation, Controls should operate freely without binding.	
	<p data-bbox="298 789 1312 842">NOTE 1. OPERATIONAL TEST. During operation observe for any unusual noise or vibration.</p> <p data-bbox="298 890 1227 915">NOTE 2. ADJUSTMENTS. Make all necessary adjustments during operational test.</p>	

MEC 3930-257-20/3 (2)

Figure 3-Continued.

14. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3

calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3 for quarterly preventive maintenance services.

Section III. TROUBLESHOOTING

15. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the forklift truck and its components. Each trouble symptom stated is followed by a list of probable

causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any remedy beyond the scope of organizational maintenance will be reported to direct support maintenance.

16. Troubleshooting Chart

a. *Electrical.*

(1) *Truck will not start or develop full pointer.*

Probable cause	Remedy
Dead battery	Charge or replace (par. 28).
Fusetron blown.....	Replace (par. 74).
Defective battery plug or receptacle	Replace plug or receptacle (par. 20i).
Braided shunt in relay broken.....	Refer to direct support.
Contacts dirty, worn or broken in relay or directional switch	Replace switch (par. 76), or refer to direct support.
Dirt in relay causing mechanical restriction.	Clear relay thoroughly.
Mechanical binding in relay or accelerating switch.	Refer to direct support.
Pole faces of plugging magnet not sealing properly.	Refer to direct support.
Snap switches malfunctioning in accelerator switch.	Replace as necessary (par. 73).
Seat switch not working.....	Adjust or replace switch (par. 36f (2)).
Open circuit due to loose connections in accelerator master switch.	Clean and secure connections firmly (par. 73).

(2) *All speeds not obtainable.*

Probable cause	Remedy
Open in relay main circuit.....	Refer to direct support.
Pole faces of plugging magnet not making good contact.	Refer to direct support.
Object lodged in relay	Remove object.
Dirty contacts on relay.....	Replace contacts (par. 72).
Switches in accelerating master malfunctioning.	Replace as necessary (par. 73).
Sticking or binding of accelerator in any part of stroke.	Refer to direct support.

(3) *Overheating.*

Probable cause

Remedy

Dirty relay contacts.....Replace contacts (par. 72).
Broken, worn or improperly adjusted brushes or brush holders in travel motor. Refer to direct support.
Vehicle operating in low speed for prolonged periods. No technical remedy. Advise operator to avoid practice if possible.

(4) *Improper plugging control and timing through all speeds.*

Probable cause

Remedy

Improper timing through all speedsRefer to direct support.
Trucn fails to leave first speed.....Refer to direct support.
Shorted wiresRefer to direct support.
Open relay in main circuit.....Refer to direct support.
Dirt in relay or directional switch.....Clean unit thoroughly.
Dirty contact in relay or directional switch. Clean contacts.

b. Brakes.

(1) *Brakes dragging.*

Probable cause

Remedy

Plugged master cylinder compensating port. Open wheel cylinder bleeder fitting. If brakes release when fluid escapes, replace master cylinder.
Seat brake improperly adjusted.....Adjust so that brake does not drag when seat is down and is firmly applied when seat is up (par. 36f).
Mineral oil in brake system.....Refer to direct support.
Improper service brake adjustmentAdjust (par. 37).

(2) *Brake pedal goes to floor.*

Probable cause

Remedy

Worn lining.....Adjust lining clearance (par. 37), or install new lined shoes (par. 38).
Air in systemBleed system (par. 38).
Improper brake adjustment.....Adjust (par. 37).
Fluid low in master cylinderReplenish fluid and check for leaks.
Pedal improperly adjusted.....Refer to direct support.

(3) *Brake pedal under pressure gradually goes to floor plate.*

Probable cause

Remedy

Leaks in hydraulic brake system.....Locate and eliminate leaks.
Scored master cylinder barrel or defective cup. Replace master cylinder (par. 39).

(4) *Brake pedal has springy or rubbery action.*

Probable cause

Remedy

Air in systemBleed system (par. 38).
Improper brake adjustment.....Adjust (par. 37).

(5) *Weak braking action.*

Probable cause

Remedy

Improperly adjusted brakesAdjust (par. 37).
Oil on liningsReplace (par. 38).
Incorrect liningReplace (par. 38).

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(6) *Harsh braking action.*

Probable cause

Remedy

- Brake lining grease or oil soaked..... Replace (par. 38).
- Brakeshoes improperly adjusted..... Adjust (par. 37).
- Brake backing plate loose Refer to direct support.

(7) *Brake releases slowly.*

Probable cause

Remedy

- Hydraulic fluid congealed Drain, flush and replace with proper brake fluid (par. 37).
- Retraction of brakeshoes restricted by weak return springs or dirt. Clean, adjust or replace as necessary {par. 38}.
- Dirt in master cylinder Replace (par. 3,1).

(8) *Truck pulls to one side.*

Probable cause

Remedy

- Improperly set brakeshoes Adjust (par. 37).
- Brake lining grease or oil soaked..... Replace (par. 38).

c. *Steering.*

(1) *Difficult steering or wandering.*

Probable cause

Remedy

- Steering gear adjustment too slack..... Readjust (par. 44).
- Damaged drag link Refer to direct support.
- Defective steering gear Refer to direct support.
- Excessive leakage of fluid..... Repair leaks, or refer to direct support.

(2) *Fluctuating hydraulic pressure or loss of system pressure.*

Probable cause

Remedy

- Low oil level in steering reservoir Replenish per LO 10-3930-257-20.

(3) *Power steering inoperative.*

Probable cause

Remedy

- Fusetron blown..... Replace (par. 74).

d. *Hydraulic.*

(1) *Lift carriage will not lift load.*

Probable cause

Remedy

- Oil leaks in hoses Inspect fittings and couplings. Tighten or replace as required (par. 65).
- Defective pump Replace (par. 57).
- Fusetron blow..... Replace (par. 74).
- Defective control valve Replace.

(2) *Load creeps down from raised position.*

Probable cause

Remedy

- Oil leak in lines..... Tighten fittings (par. 65).
- Leaky control valve Tighten connections, replace valve if necessary (par. 58).

(3) *Hoisting speed erratic.*

Probable cause

Remedy

Air in system Bleed air from system by operation.
Low level in reservoir Fill reservoir to prescribed level (LO 10-3930-257-20).

(4) *Control valve plungers will not return to neutral.*

Probable cause

Remedy

Sticking plungers..... Replace control valve (par. 58).
Broken springs or dirt lodged in seats..... Replace valve (par. 58).

(5) *Forks uneven when load is lifted.*

Probable cause

Remedy

Lift chains out of adjustment..... Adjust so chain raises forks evenly (par. 63).

(6) *No motion of hydraulic unit when first started up.*

Probable cause

Remedy

Oil supply in tank too low..... Fill per LO 10-3930-257-20.
Oil viscosity too heavy Change to oil specified in LO 10-3930-257-20.
Air leak in pump inlet line Tighten hose (par. 65).
Restricted pump inlet line..... Repair or replace (par. 65).
Broken pump drive shaft, motor shaft or coupling. Replace pump (par. 57) or motor (par. 70).
Pump completely worn out..... Replace pump (par. 57).
Weak or broken relief valve spring..... Replace control valve (par. 58).
Relief valve plunger stuck by dirt or foreign matter. Replace control valve (par. 58).
Pump rotating in wrong direction Check motor internal connections.
Insufficient pressure to start load..... Refer to direct support.
Machine overloaded..... Reduce load.
Failure at switch Replace (par. 77).

(7) *Loss of motion during operation.*

Probable cause

Remedy

Loss of oil supply due to broken pump inlet, outlet or cylinder connecting lines or tank return line. Replace line (par. 65).

(8) *Slow motion.*

Probable cause

Remedy

Pump wearing out Replace (par. 57).
Pump rpm too slow Check pump motor (par. 70), battery.
Failure in hydraulic lines..... Replace (par. 65)
Relief valve plunger held partially off its seat by dirt or foreign matter. Replace control valve (par. 58).
Badly scored relief valve plunger or seat. Replace control valve (par. 58).
Weak relief valve spring..... Replace control valve (par. 58).
Aerated oil supply (foam in tank) Change oil (LO 10-3930-257-20).
Oil too thin See LO 10-3930-257-20 for proper grade.
Oil supply too low..... Fill reservoir (LO 10-3930-257-20).
Worn or scored piston packing Refer to direct support.
Bore of cylinder tube badly scored or nicked. Refer to direct support.
Cylinder misalignment..... Correct chain adjustment (par. 63).

(8) *Slow motion-Continued.*

Probable cause

Mechanical obstruction of moving parts Remove obstruction.

Remedy

(9) *Jerky motion.*

Probable cause

Air in system Bleed hydraulic system.
Cylinder misaligned due to structural warpage. Refer to direct support.

Remedy

(10) *Speed or operation slows down after usage.*

Probable cause

Pump worn..... Replace (par. 57).
Improper oil used in system..... See LO 10-3930-257-20 for proper grade.
Dirt or foreign matter in system Drain, flush out system, replace with new oil.

Remedy

11) *Noisy operation.*

Probable cause

Air in hydraulic system Bleed system.
Insufficient oil supply..... Fill reservoir (LO 10-3930-257-20).
Pump worn out..... Replace (par. 57).
Air leak in pump intake line Tighten hose (par. 65).
Misalignment between motor shaft and pump drive shaft. Tighten attaching parts.
Vibration of pump lines..... Secure lines.
Chattering relief valve. Weak relief valve spring. Replace control valve (par. 58).
Incorrectly set relief valve pressure Replace control valve (par. 58).
Broken or cracked gears in pump Replace pump (par. 57).

Remedy

(12) *Oil heats up rapidly.*

Probable cause

Pump slippage, oil too thin See LO 10-3930-257-20.
Continued operation at relief valve pressure setting. Check operation (TM 10-3930-257-10).
Operating pressure is close to relief valve pressure setting. Check operation (TM 10-3930-257-10).
Operating at excessively high pressure Refer to direct support.
Dirty oil Change oil (LO 10-3930-257-20).
Misalignment between pump drive shaft and motor shaft. Tighten attaching parts.

Remedy

(13) *Hoist cylinder packing leaks.*

Probable cause

Defective hoist cylinder Refer to direct support.

Remedy

(14) *Hoist or tilt cylinder lowers or tilts while truck stands idle.*

Probable cause

Worn packing..... Refer to direct support.
Worn or scored seals, packing or cylinders. Refer to direct support.
Failure in hydraulic line Check, tighten or replace line (par. 65).

Remedy

(15) *Reservoir flows over.*

Probable cause

Excess oil in reservoir Check oil level with forks in lowered position and tilted back.

Remedy

Section IV. ELECTRICAL SYSTEM

17. General

This section presents instructions for organizational

maintenance of the electrical system. Figure 4 shows the location of components.

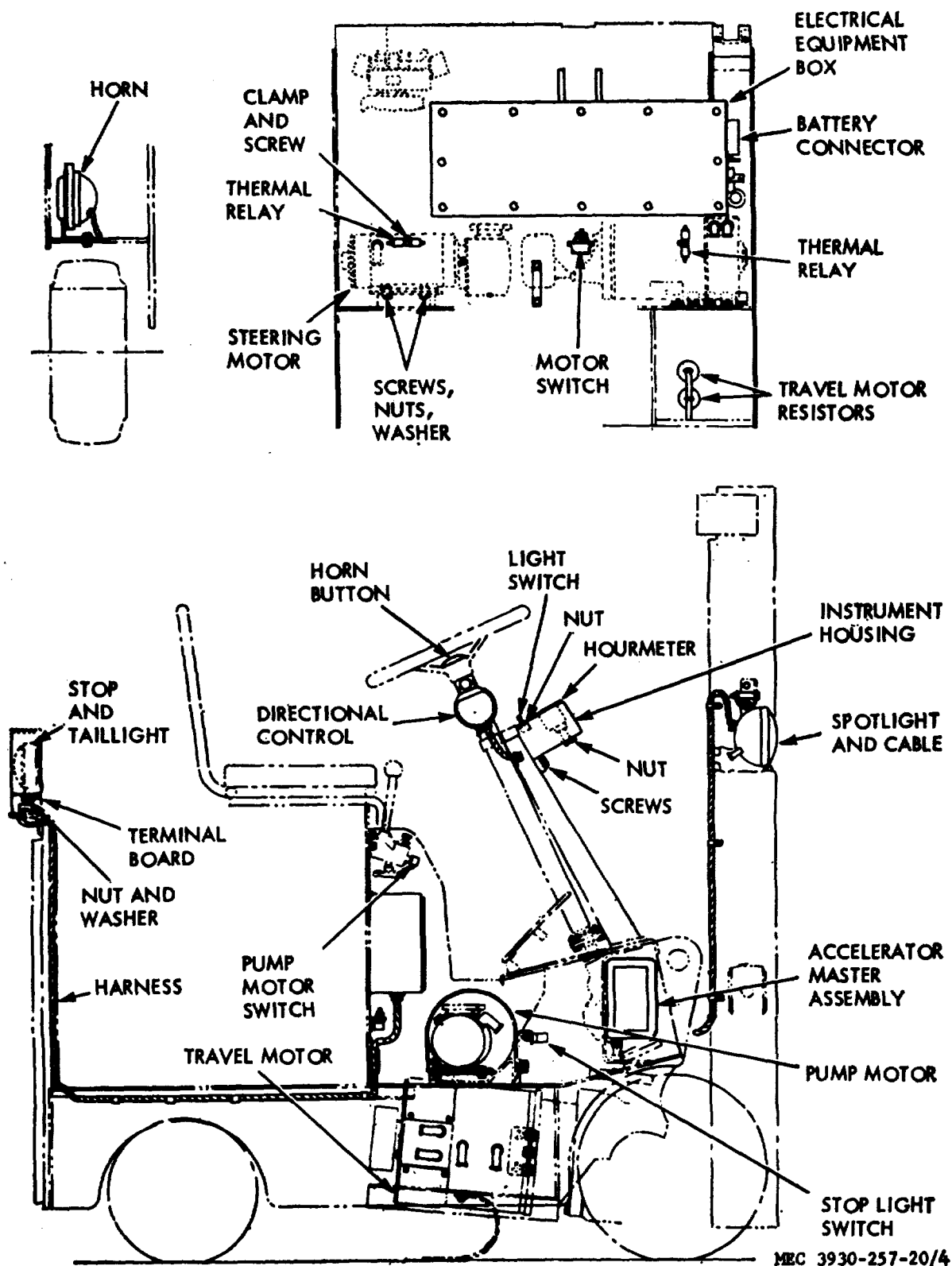


Figure 4. Electrical system arrangement.

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18. Hourmeter

a. Removal.

- (1) Remove two screws attaching instrument housing (fig. 4) to truck, and remove housing.
- (2) Remove nut at bottom of instrument housing, and lift hourmeter out of housing.
- (3) Disconnect two leads at hourmeter, tape ends, and tag leads for identification.

b. Installation. Reverse procedures in a above.

19. Light Switch

a. Removal.

- (1) Remove two screws attaching instrument housing (fig. 4) to truck, and remove housing.
- (2) Remove nut at top of light switch and lower switch out bottom of instrument housing.
- (3) Disconnect, tape and tag leads from switch.

b. Installation. Reverse procedures in a above.

20. Battery Connector Receptacle

- ### a. Removal.
- Remove four screws shown in figure 5 and disconnect leads from receptacle.

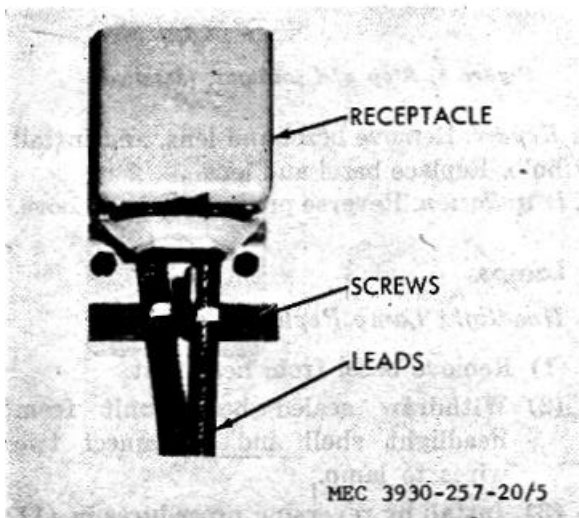


Figure 5. Battery connector receptacle.

b. Installation. Reverse procedures in a above.

21. Stop Light Switch

Before replacing switch, check that it is truly defective, and not merely in need of adjustment, and that leads are correctly installed.

a. Inspection and Test.

- (1) Remove floor plate (par. 54).
- (2) Inspect that wires labeled (+) and (33) to switch (fig. 6) are connected to terminals marked A and wires (9) and (10) are connected to B terminals. If not, connect them correctly before proceeding.
- (3) Connect a voltmeter lead to each A terminal, and operate switch button by hand. If meter reads system voltage with button free, and zero voltage with button pressed, switch is operative. Test at B terminals for opposite results. Continue to (4) following.
- (4) With voltmeter still connected as above in (3), operate pedal manually. If operation of pedal doesn't give same results, switch position must be adjusted so brake application closes switch at A terminals and opens switch at B terminals, reversing this on releasing brake pedal.

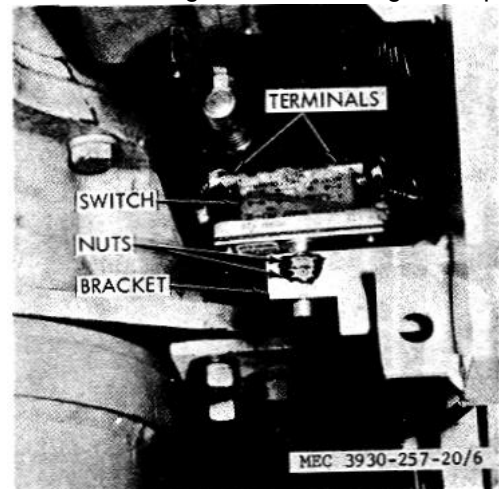


Figure 6. Stop light switch, installed.

b. Adjustment. Disconnect leads, and loosen two nuts shown in figure 6. Adjust switch position by turning it in or out so switch lights stoplight before braking action begins, and light goes out before pedal reaches top of travel. Tighten nuts.

c. Removal.

- (1) Remove floor plates (par. 54).
- (2) Remove outermost nut (fig. 6) and take switch from bracket.
- (3) Disconnect wires from switch A terminals.

d. Installation. Reverse procedures in c above and adjust switch (b above).

22. Headlight

a. Removal.

- (1) Remove clamps (fig. 7) holding conduit to upright.
- (2) Disconnect two wires at terminals at bottom end of conduit.
- (3) Remove two screws, nuts, and washers attaching light to upright and remove light and conduit as an assembly.

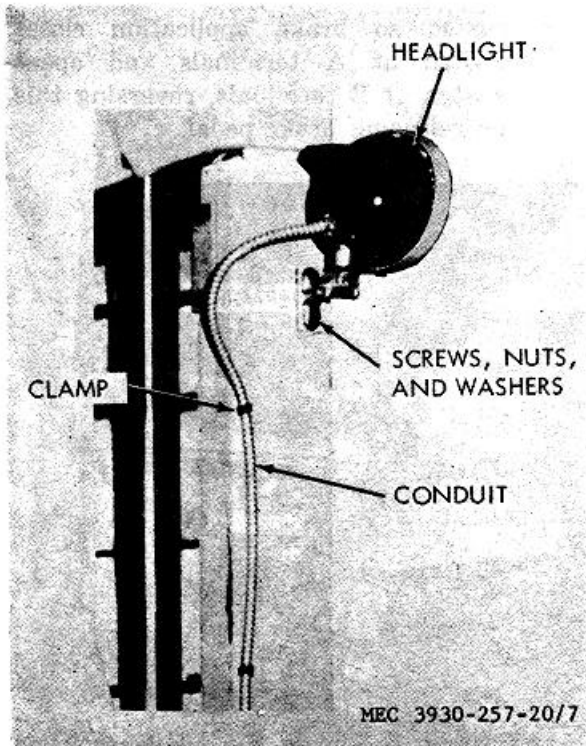


Figure 7. Headlight, installed.

b. Repair. Repair of headlight is confined to replacing sealed beam lamp. Refer to paragraph 24a.

c. Installation. Reverse procedures in a above.

23. Stop and Taillight

a. Removal.

- (1) Remove two screws, nuts, and washers (fig. 8) attaching guard to truck. Lift guard and disconnect light wires from terminal board under guard.
- (2) Remove screws holding screen to guard, and remove screen.
- (3) Remove nut and washer holding light assembly to guard, and remove guard.

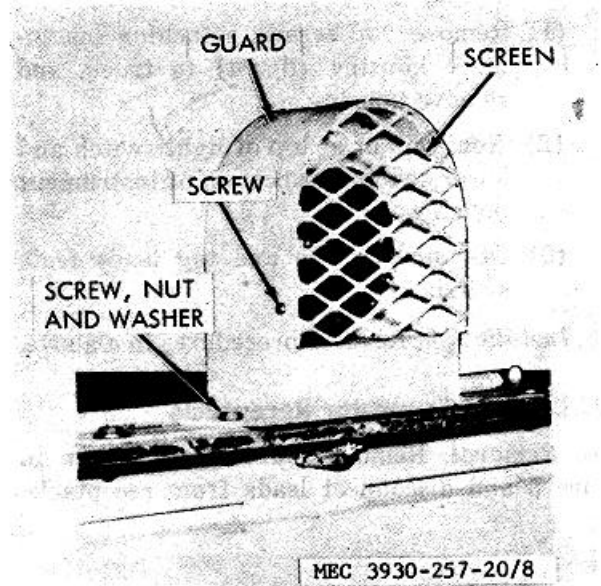


Figure 8. Stop and taillight, installed.

b. Repair. Remove bezel and lens, and install new bulb. Replace bezel and lens.

c. Installation. Reverse procedures in a above.

24. Lamps

a. Headlight Lamp Replacement.

- (1) Remove bezel from headlight.
- (2) Withdraw sealed beam unit from headlight shell and disconnect two wires to lamp.
- (3) Install by reversing procedures in (1) and (2) above.

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b. *Stop and Taillight Lamp Replacement.* Refer to paragraph 23.

25. Taillight Resistor

a. Removal.

- (1) Remove electrical equipment box cover (fig. 4).
- (2) Disconnect wires numbered 32 and 33 from resistor, located at center of box, on board. Remove two mounting screws and remove resistor.

b. *Test.* Test resistor with ohmmeter across terminals for 40 ohms resistance, plus or minus 20 percent.

c. *Installation.* Reverse procedures in a above.

26. Horn

a. Removal.

- (1) Disconnect wires (fig. 9) from horn.
- (2) Remove screws holding horn to truck frame and remove horn.

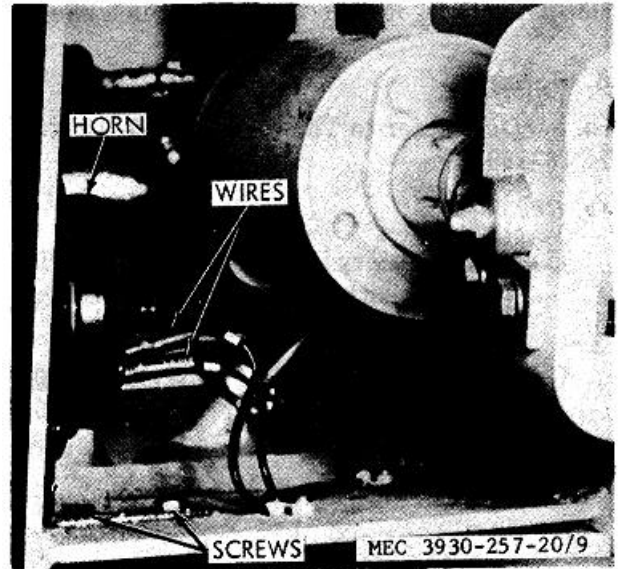


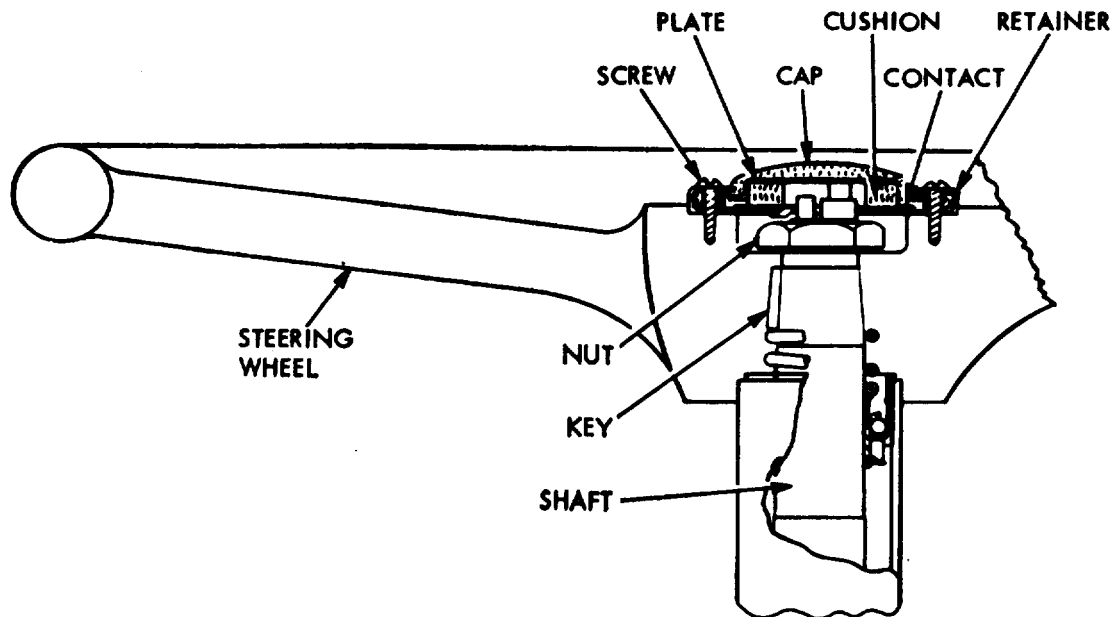
Figure 9. Horn, installed.

b. *Installation.* Reverse procedures in a above.

27. Horn Button

a. Removal.

- (1) Remove four screws (fig. 10) and lift off retainer, cap, plate, and cushion.
- (2) Lift out contact.



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Figure 10. Horn button.

b. *Installation.* Reverse procedures in a above.

28. Battery

a. *Service.* Refer to TM 10-3930-257-10, and TM 10-1690A.

b. *Removal.*

- (1) Open battery compartment, and disconnect battery leads from truck at receptacle (TM 10-3930-257-10).
- (2) With a hoist rated at more than 2,000 pounds capacity, lift battery from truck by hooks through lifting eyes at each side of battery.

Caution.

Use spreader bar as wide as battery between lifting hooks to avoid inward pull on battery case. Keep personnel at a distance during removal operation to minimize risk from electrolyte spillage.

c. *Installation.* Reverse procedures in a above.

29. Headlight, Stop and Taillight Wiring Harness Repair

Wiring to these lights is contained in flexible metal conduit. It is not practical to repair this wiring. If damaged, refer to direct support for replacement.

Section V. POWER AXLE

30. Power Axle Service

All service of the power axle is given in LO 10-3930-257-20.

Section VI. REAR AXLE

31. General

Since the rear axle provides steering for the truck, it is functionally associated with the steering gear. Maintenance at organizational level is limited to adjustment of the tie rods for toe-in. Related steering system adjustments will be found in paragraph 44.

32. Adjustment of Wheel Alignment

a. *Measurement.* Determine if wheel alignment adjustment is needed as follows:

- (1) With rear axle (fig. 11) level front to rear, and wheels in straight ahead position, measure inside span between tires at hub height at front of axle.
- (2) Repeat (1) above at rear of axle.
- (3) If measurements obtained in (1) and (2) above differ by over 1/16 inch, adjust as given in b below until wheels are parallel to within 1/16 inch as measured in (1) and (2) above.

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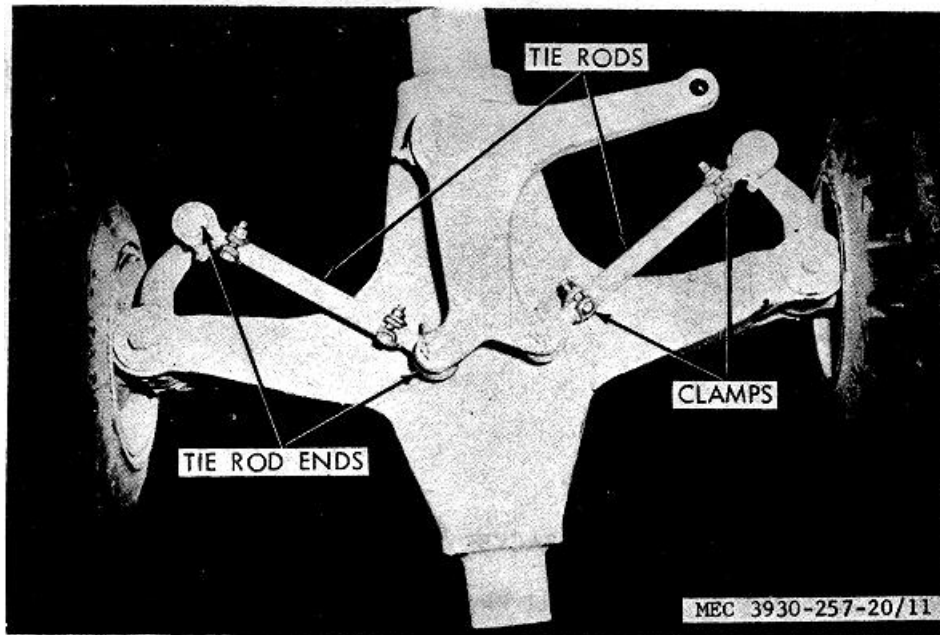


Figure 11. Steering axle adjustment.

b. Adjustment.

- (1) Loosen (but do not remove) screws and nuts through all tie rod end clamps (fig. 11).
- (2) Turn each tie rod an equal number of turns in the direction necessary to change toe-in as required. Each tie rod has right-hand threads at one end, left-hand

threads at the other, so adjustment can be made to change effective length without dismantling tie rod.

- (3) When adjustment has been completed, tighten tie rod clamp screws and washers.

33. Steering Knuckle Service

All steering knuckle service allocated to operational maintenance is given in LO 10-3930-257-20.

Section VII. BRAKES

34. General

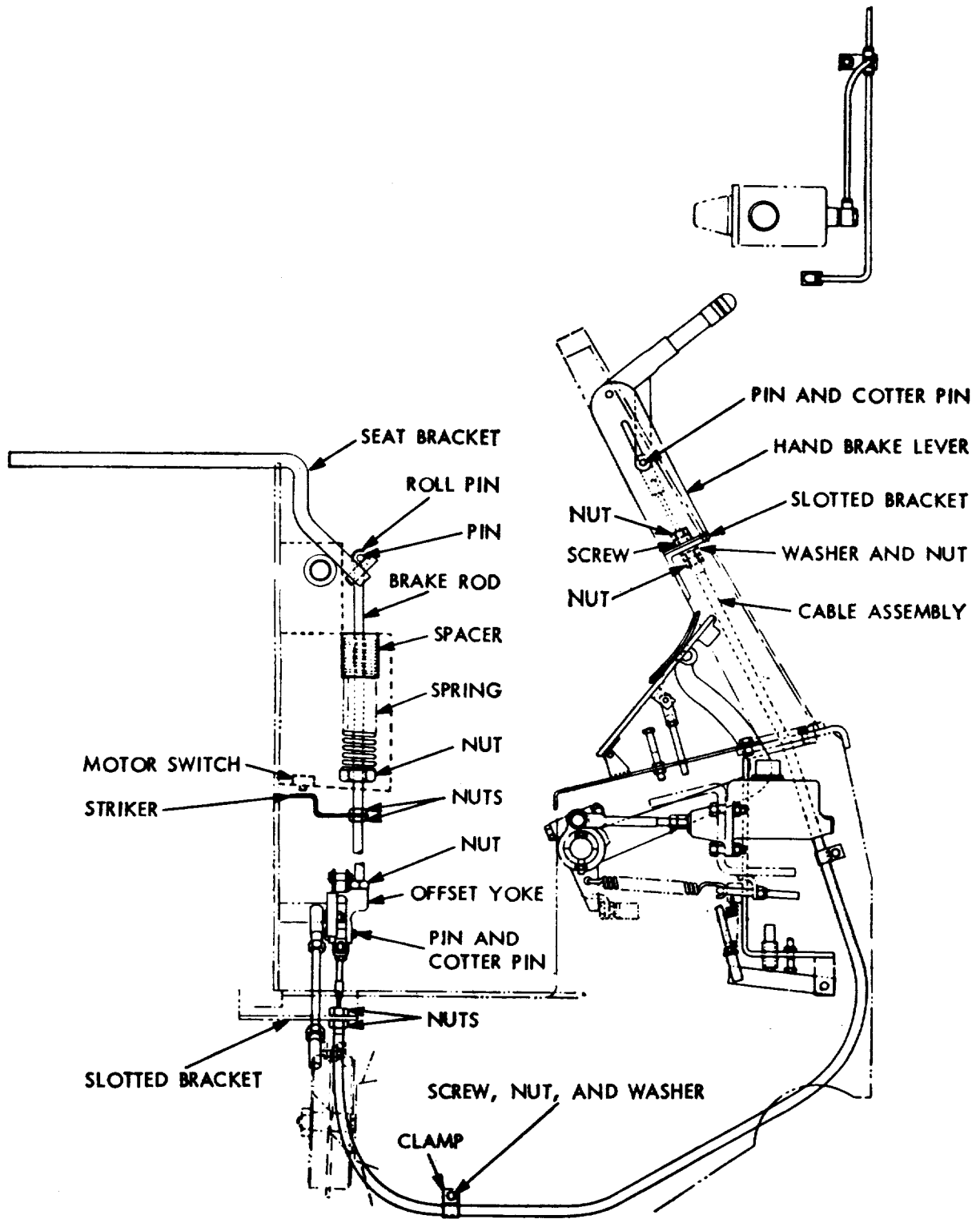
This section contains organizational maintenance instructions for the mechanical (parking) and hydraulic (service) brake systems used on the truck.

35. Handbrake Lever

a. Removal.

- (1) Release handbrake, and remove screws, nuts, and washers which attach handbrake lever (fig. 12) to bracket on steering column.
- (2) Remove cotter pin and clevis pin attaching handbrake cable assembly to handbrake lever, and remove lever.

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Figure 12. Parking brake controls.

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b. *Installation.* Reverse procedures in a above.

36. Brake Cable and Brake Rod

a. Cable Removal.

- (1) Remove handbrake lever (par. 35a).
- (2) Loosen two nuts holding cable to slotted bracket on steering column and slide cable from slot.
- (3) Remove screws, nuts, washers, and two clamps holding cable assembly to truck frame.
- (4) Remove pin and cotter pin attaching cable to offset yoke, loosen two nuts at slotted bracket in truck, and remove cable assembly from truck.

b. *Cable Installation.* Reverse procedures in a above.

c. *Cable Adjustment.* Position cable housing by adjusting nuts at both slotted brackets until brake releases fully, and locks in applied position with a definite snap action.

d. Brake Rod Removal.

- (1) Run down large nut (fig. 12) under spring, until spring tension is relieved.
- (2) Drive out roll pin and remove pin from eye at top of brake rod.

Warning:

Be sure spring tension is relieved before removing pin.

- (3) Loosen jamnut on brake rod at offset yoke, unscrew rod from yoke, and remove rod with striker, spring, and spacer attached.

e. *Brake Rod Installation.* Install spacer, spring, striker, and nuts as shown in figure 12, on rod, and reverse procedures in d above.

f. *Brake Rod Adjustment.* After installation, perform the following:

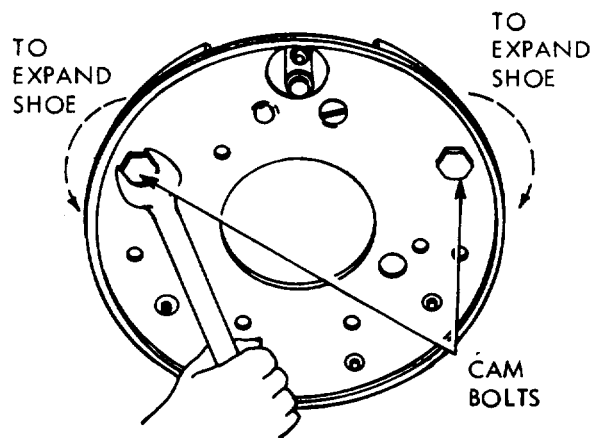
- (1) Adjust spring tension raising seat to suit operator, by turning large nut beneath spring.
- (2) Adjust position of motor switch striker, with seat bottomed as by operator's weight, so motor switch is definitely

actuated. Run two striker jamnuts up or down rod to position striker.

37. Service Brakes

a. *Brake Adjustment.* Adjust brakeshoes by adjusting cam bolts (fig. 13).

- (1) Jack up front wheels as follows:
 - (a) Tilt mast to extreme back position.
 - (b) Place block directly under mast at lift cylinder.
 - (c) Tilt mast forward until wheels are clear.
- (2) Raise lift carriage for access, and block carriage up for safety while working.
- (3) Each wheel brake has two cam bolts. one at front, one at rear, of backing plate. Turn front cam bolts toward front of truck to bring front lining in contact with brakedrum until wheel drags slightly when turned by hand. Back off adjusting cam only enough to allow free rotation.
- (4) Repeat procedure at rear shoe adjusting cam bolt, turning bolt toward rear of truck for contact. Make both adjustments at each wheel as uniform as possible.



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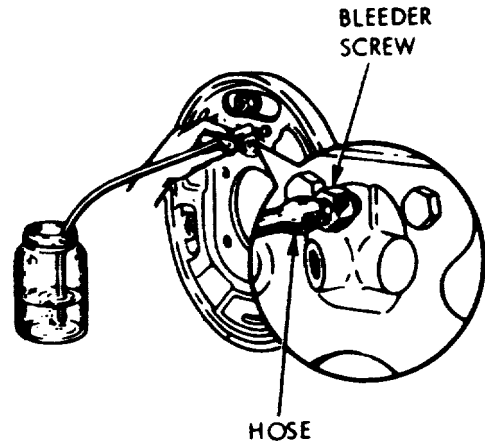
Figure 13. Service brake adjustment.

b. *Bleeding Service Brake System.* The hydraulic brake system must be bled to expel air in system. The need generally is indicated by springy or spongy brake pedal action. Two men are required to bleed system, one to maintain a constant supply of fluid in master cylinder and to pump brake pedals, the other to perform bleeding operation.

- (1) Remove filler plug from master cylinder and fill with hydraulic brake fluid.
- (2) Clean bleeder screws at each wheel cylinder (fig. 14). Attach one end of bleeder hose to bleeder screw and place other end of hose in clean container partially filled with hydraulic brake fluid. Be sure end of hose is submerged in the hydraulic fluid.
- (3) Turn bleeder screw counterclockwise three-quarters of a turn. Apply a steady pressure to brake pedal. Hydraulic fluid containing air bubbles should be forced through bleeder hose into container.
- (4) Maintain fluid level in master cylinder and continue to operate brake pedal until fluid flows in a steady solid stream without air bubbles. Close bleeder screw by turning in clockwise direction. Remove bleeder hose.
- (5) Repeat bleeding procedure at other wheel, replenishing brake fluid supply in master cylinder before each wheel cylinder is bled. Replace filler plug in master cylinder.

Caution.

Hydraulic brake fluid from brake system must not be reused.



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Figure 14. Bleeding brakes.

38. Brakeshoes

a. *Removal.*

- (1) Remove front wheels (par. 41).
- (2) Hold retainer pin (fig. 15) from rear of brake, press outer spring retainer inward and turn it one-fourth turn to free it. Remove retainer cups and springs, and retainer pins.
- (3) With brake spring pliers, remove brakeshoe return spring, and retainer spring. Carefully remove brakeshoes, and install brake clamps on wheel cylinder to prevent pistons coming out from residual pressure in brake lines.

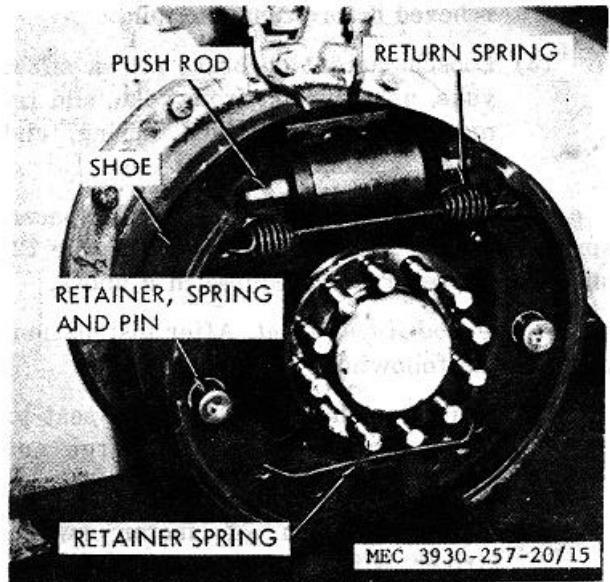


Figure 15. Brakeshoe removal.

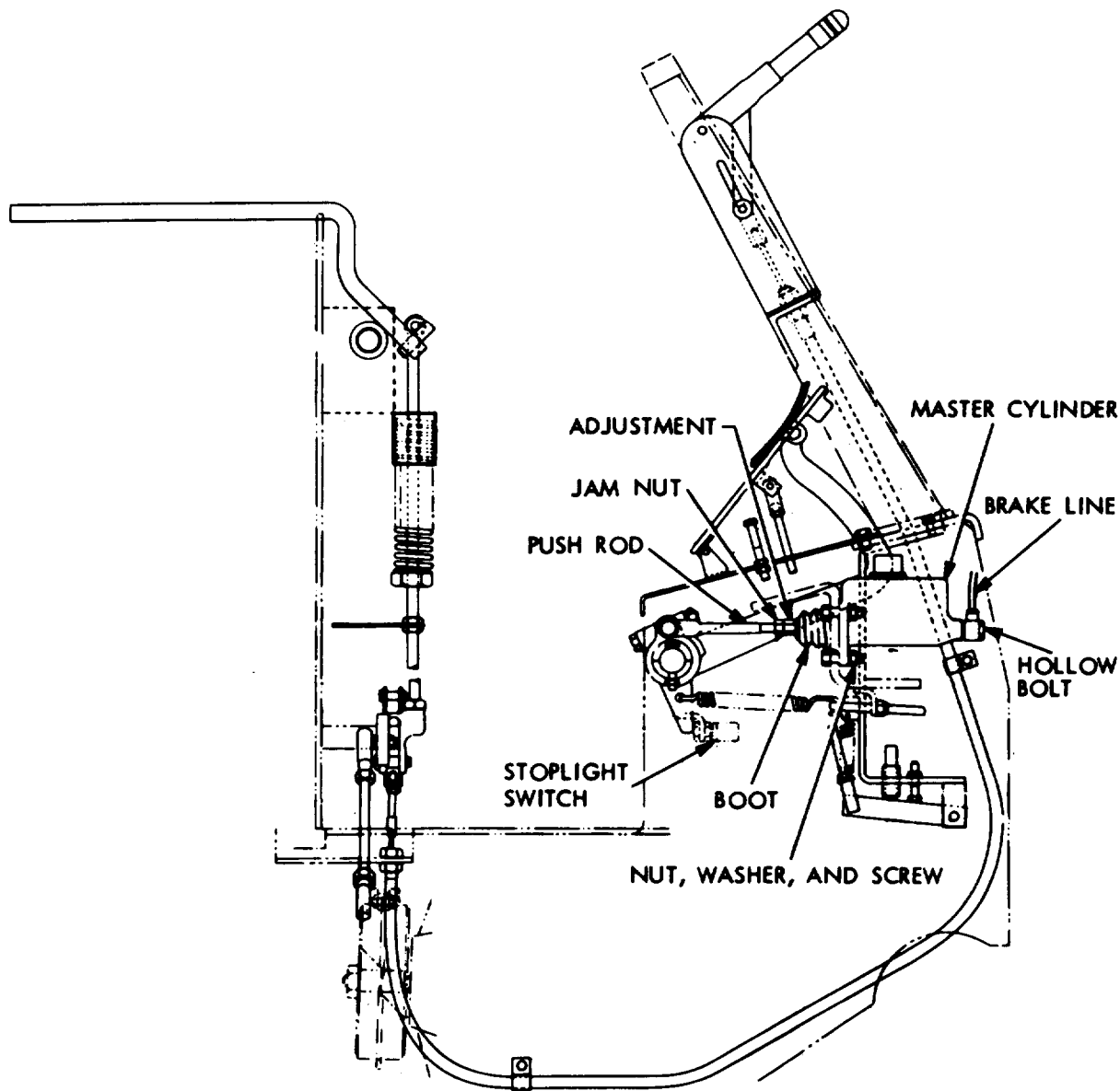
b. Installation.

- (1) Reverse procedures in a(3) and (2) above in that order.
- (2) Temporarily adjust shoes inward as far as they will go. This consists essentially of reversing paragraph 37a, which will make wheel installation easier.
- (3) Install front wheels (par. 41) and adjust brakes (par. 37a).

39. Master Cylinder

a. Removal.

- (1) Remove floor plate (par. 54).
- (2) Remove hollow bolt (fig. 16) and brake line fitting from front of master cylinder. Take precautions to keep dirt from entering brake line.
- (3) Remove nuts, washers, and screws attaching master cylinder to truck, and remove master cylinder. Push rod will remain in place.



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Figure 16. Master cylinder.

b. *Installation.*

- (1) Reverse procedures in a above.
- (2) Fill cylinder with brake fluid (LO 10-3930-257-20).
- (3) Bleed brake hydraulic system (par. 37b), and adjust wheel brakes (par. 37a).

- (4) Loosen jamnut on push rod, and adjust length of push rod to give 1/4, to 5/8 inch free travel of pedal before brake application begins. Tighten jamnut to secure adjustment.

Section VIII. WHEELS

40. General

This section contains instructions for replacement of truck wheels, and service and replacement of rear wheel bearings. Refer service other than this to higher maintenance level.

41. Wheels

a. *Front Wheel Removal.*

- (1) Jack up front of truck (par. 37a(1)).
- (2) Remove nuts holding wheel to truck.
- (3) Remove wheel.

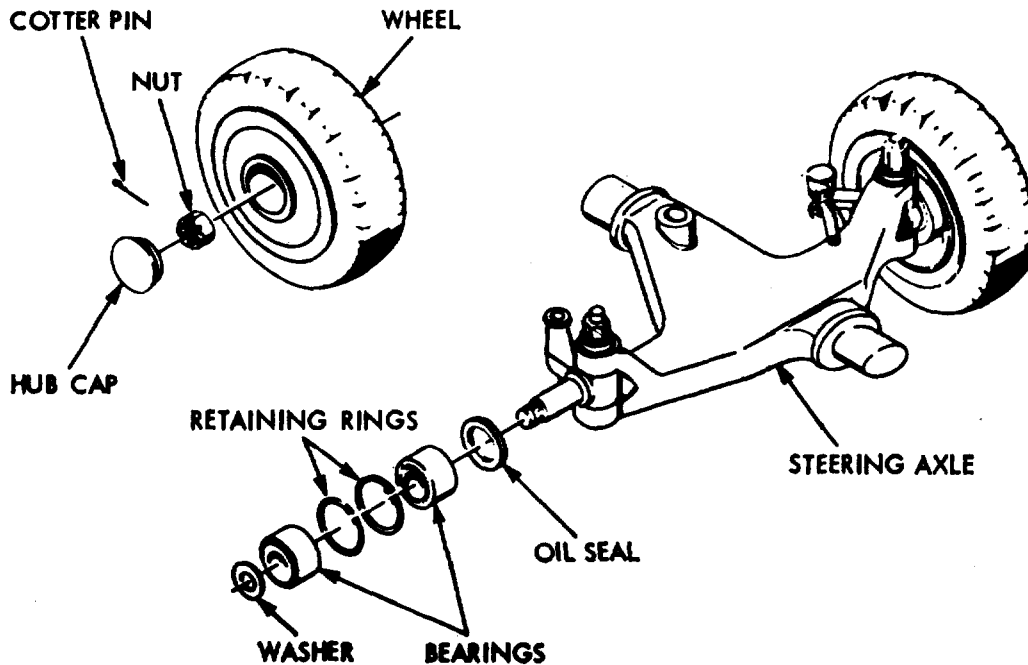
Note.

If brake lining drags on wheel, interfering with removal, slack off adjustment as explained in paragraph 38b(2).

b. *Front Wheel Installation.* Reverse a above, and adjust brakes (par. 37a).

c. *Rear Wheel Removal.*

- (1) Lower forks fully and tilt mast back. Raise rear of truck until wheels clear floor.
- (2) Remove hubcap (fig. 17), and remove cotter pin, nut, and washer from bore of wheel.
- (3) Draw wheel from steering axle spindle. Because of manufacturing tolerances the cone and rollers of the inboard bearing may remain with spindle. If so, it can easily be removed. Avoid damaging oil seal if possible when removing wheel.



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Figure 17. Rear wheel removal.

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d. *Rear Wheel Installation.* Reverse procedures in c above, tightening wheel nut snug, then backing it off not more than one-sixteenth turn, and install cotter pin.

42. Rear Wheel Bearings

a. Removal.

- (1) Remove rear wheels (par. 41c).
- (2) Pull bearings from bore of wheel. A slip hammer bearing puller may be used to pull bearings from wheel if they stick in bore.
- (3) Remove retaining rings which position bearings.

b. Service.

- (1) Clean bearings with SD and dry thoroughly.
- (2) Inspect cups and rollers for wear or failure. Inspect cone and roller assemblies for roughness when rotated.
- (3) If bearings are serviceable, repack with grease GAA, using a bearing packing device, if available.

c. Installation.

 Reverse procedures in a above.

Section IX. STEERING

43. General

This section contains organizational maintenance instructions for steering gear and linkage to steering axle. Service according to instructions in LO 10-3930-257-20.

44. Steering Gear Assembly

a. Lash Adjustment.

- (1) Remove nut (fig. 18) holding drag link to pitman arm, and disconnect drag link.

Note.

If necessary, use puller, or hammer, drag link free, but do not damage threads.

- (2) Loosen jamnut and turn lash adjuster with screwdriver until steering wheel passes through center of travel with 14 to 18 ounces pull on rim. Tighten jamnut, and install drag link.

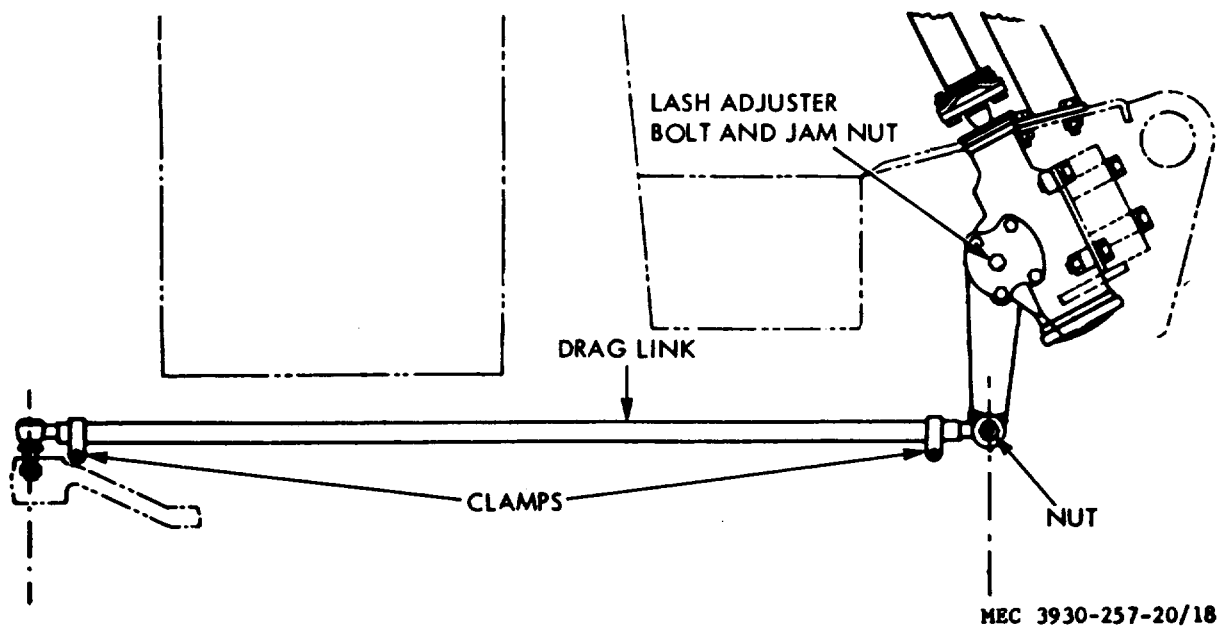


Figure 18. Steering adjustment.

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b. *Steering Linkage Adjustment.*

- (1) With steering wheel halfway between extreme right and extreme left arm, assemble pitman arm to steering gear as shown in figure 18.
- (2) With trailing axle wheels in straight ahead position, adjust drag link to proper length by loosening clamps and turning drag link tubing. Make certain pitman arm is at correct angle.
- (3) Tighten clamps.

45. Steering Wheel

a. *Removal.*

- (1) Remove horn button assembly (par. 27a).
- (2) Remove nut (fig. 10).
- (3) With a steering wheel puller, draw wheel from shaft.

Caution.

Do not try to remove wheel without proper puller, as steering gear could be damaged.

b. *Installation.* Reverse procedures in a above.

46. Power Steering Pump

a. *Removal.*

- (1) Disconnect hoses from pump (par. 47).
- (2) Remove screws and washers (fig. 19) attaching pump to motor. Remove pump.

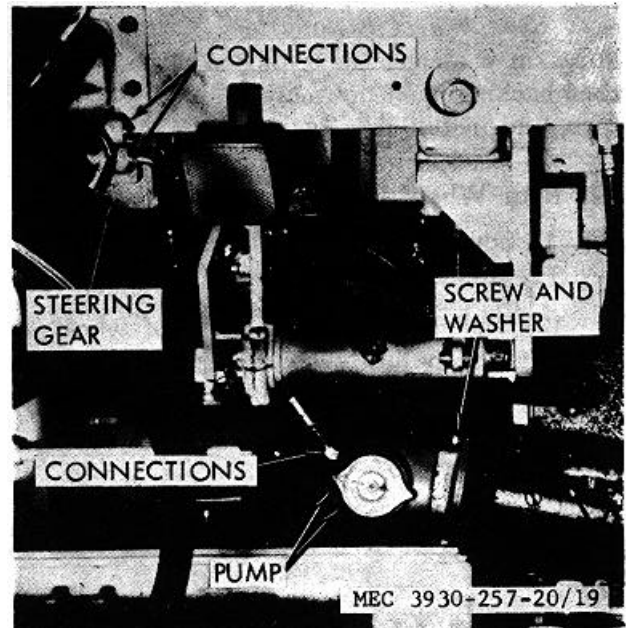


Figure 19. Steering hoses.

b. *Installation.* Reverse procedures in a above.

47. Hoses

Two hoses connect the power steering pump and steering gear. These hoses are unit assemblies which are not to be taken apart.

a. *Removal.*

Note.

Before removal, arrange a container to catch draining oil.

- (1) Remove floor plate (par. 54).
- (2) Disconnect hoses at connections at steering gear.
- (3) Disconnect hoses at power steering pump and plug all openings to exclude dirt.

b. *Installation.* Reverse procedures in a above,

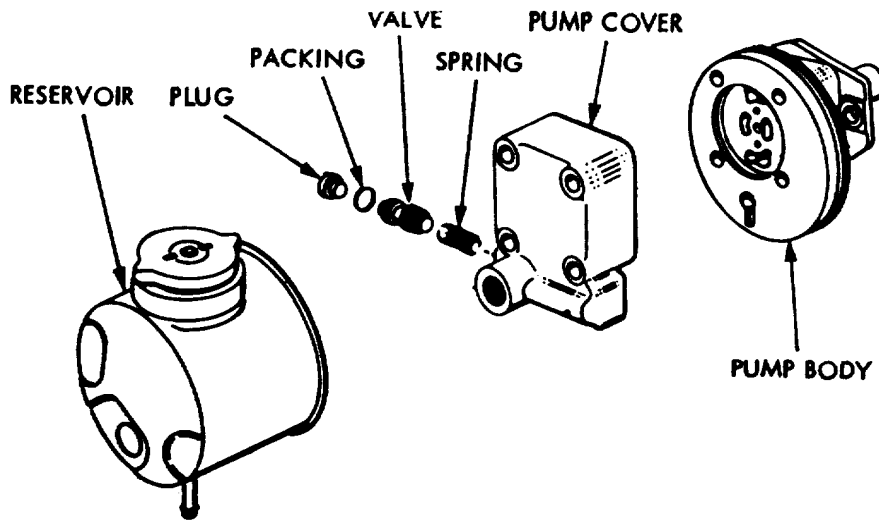
48. Power Steering Reservoir

Service according to LO 10-3930-257-20.

49. Relief Valve

a. *Removal.*

- (1) Remove floor plate (par. 54). Place pan under pump to catch oil.
- (2) Remove plug (see fig. 20) from cover, and remove packing, valve, and spring from cover.



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Figure 20. Steering pump relief valve removal.

b. *Installation.* Reverse procedures in a above, and refill reservoir with OE.

Section X. BODY AND HOOD

50. General

This section contains maintenance instructions for exterior structural components, and seat of truck, within the scope of organizational maintenance.

51. Battery Box Top Cover

a. *Removal.*

- (1) Remove taillight and guard as an assembly (par. 23a(1)).
- (2) Remove screws and nuts (fig. 21) which attach cover hinge to truck, and lift off cover.

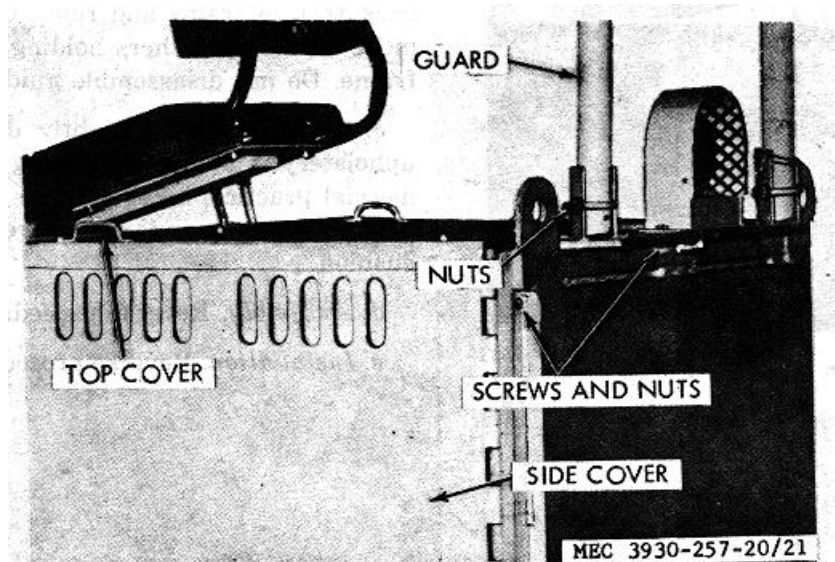


Figure 21. Battery box top cover and overhead guard.

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b. *Installation.* Reverse procedures is a above.

52. Battery Box Side Covers

a. *Removal.* Pull open side cover to be removed, remove nuts and screws (fig. 21) attaching side cover to truck, and remove cover.

b. *Installation.* Reverse procedures in a above.

53. Overhead Guard

a. *Removal.* Loosen nuts (fig. 21) on clamps at each upright of guard, and lift guard from truck.

b. *Installation.* Reverse procedures in a above.

54. Floor Plate

a. *Removal.*

(1) Unhook cowl latches (fig. 22), and lift cowl free of truck.

(2) Remove two screws at front of floor plate, and lift off floor plate.

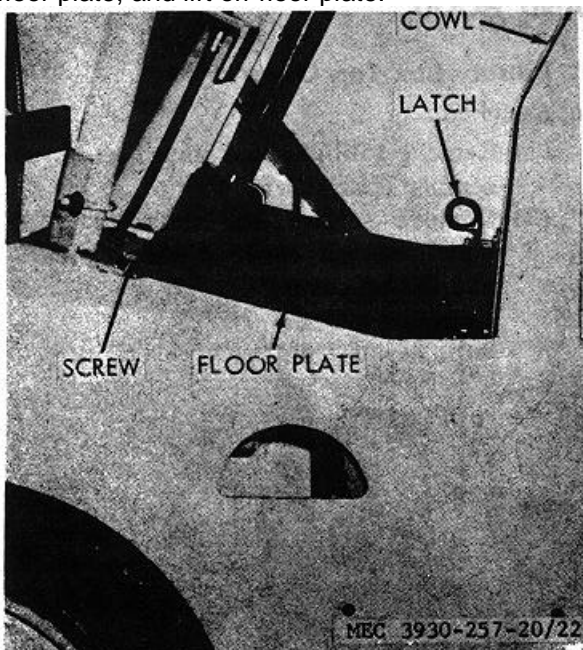


Figure 22. Floor plate.

b. *Installation.* Reverse procedures in a above.

55. Seat Assembly

a. *Removal.* Remove four screws, nuts, and washers (fig. 23) which attach assembly to brake actuating bar. Remove seat from truck.

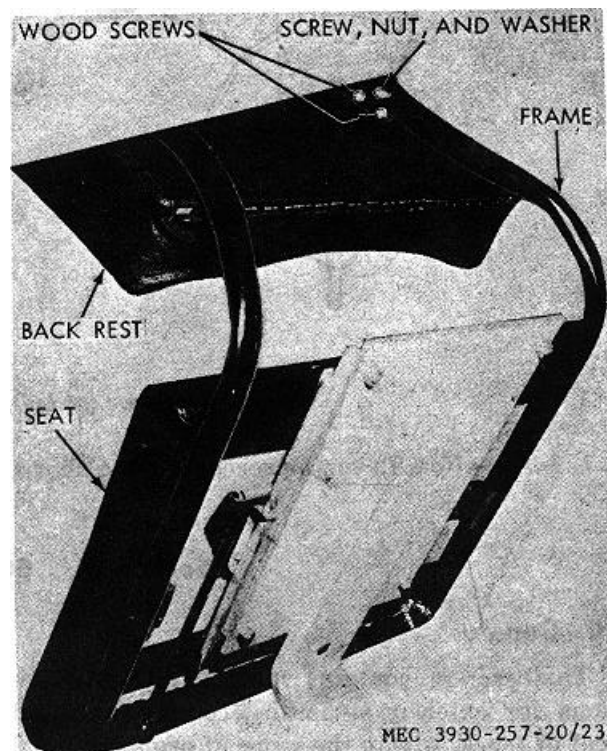


Figure 23. Seat.

b. *Disassembly.* Remove wood screws holding back rest to frame and remove back rest. Remove nuts and washers holding seat cushion to frame. Do not disassemble guide rails.

c. *Repair.* Repair slightly damaged (torn) upholstery material according to good commercial practice, by sewing, or adhesive patch. If wear or damage is extensive, replace entire cushion.

d. *Assembly.* Reverse procedures in b above.

e. *Installation.* Reverse procedures in a above.

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Section XI. HYDRAULIC LIFT COMPONENTS

56. General

This section contains instructions for organizational maintenance of hydraulic and mechanical items related to lift mechanism, including controls.

57. Hydraulic Pump Assembly

a. Removal.

- (1) Remove floor plate (par. 54).
- (2) Position a bucket under pump (fig. 21) to catch draining oil, and disconnect hose elbow fittings at pump. Remove hoses from pump and cap ends.
- (3) Remove two screws attaching pump to motor. Remove pump.

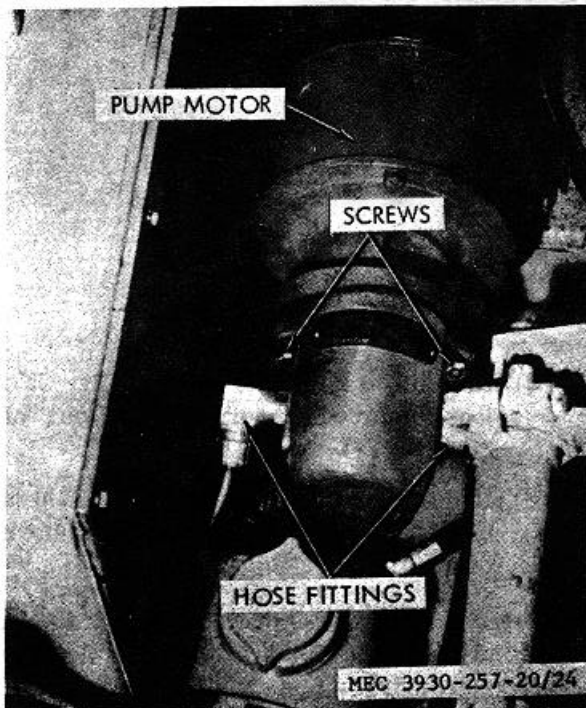


Figure 24. Hydraulic pump and motor.

b. *Installation.* Reverse procedures in a above.

58. Control Valve

a. Removal.

- (1) Remove cowl (par. 54a(1)).
- (2) Remove one cotter pin and clevis pin (fig. 25) from links at each lever, disconnecting levers from valve plungers.
- (3) Disconnect four hoses equipped with elbow fittings, remove hose clamp, and remove last hose.
- (4) Remove three nuts, screws, and washers attaching valve to truck, and remove valve. Cap or plug hoses and parts of valve.

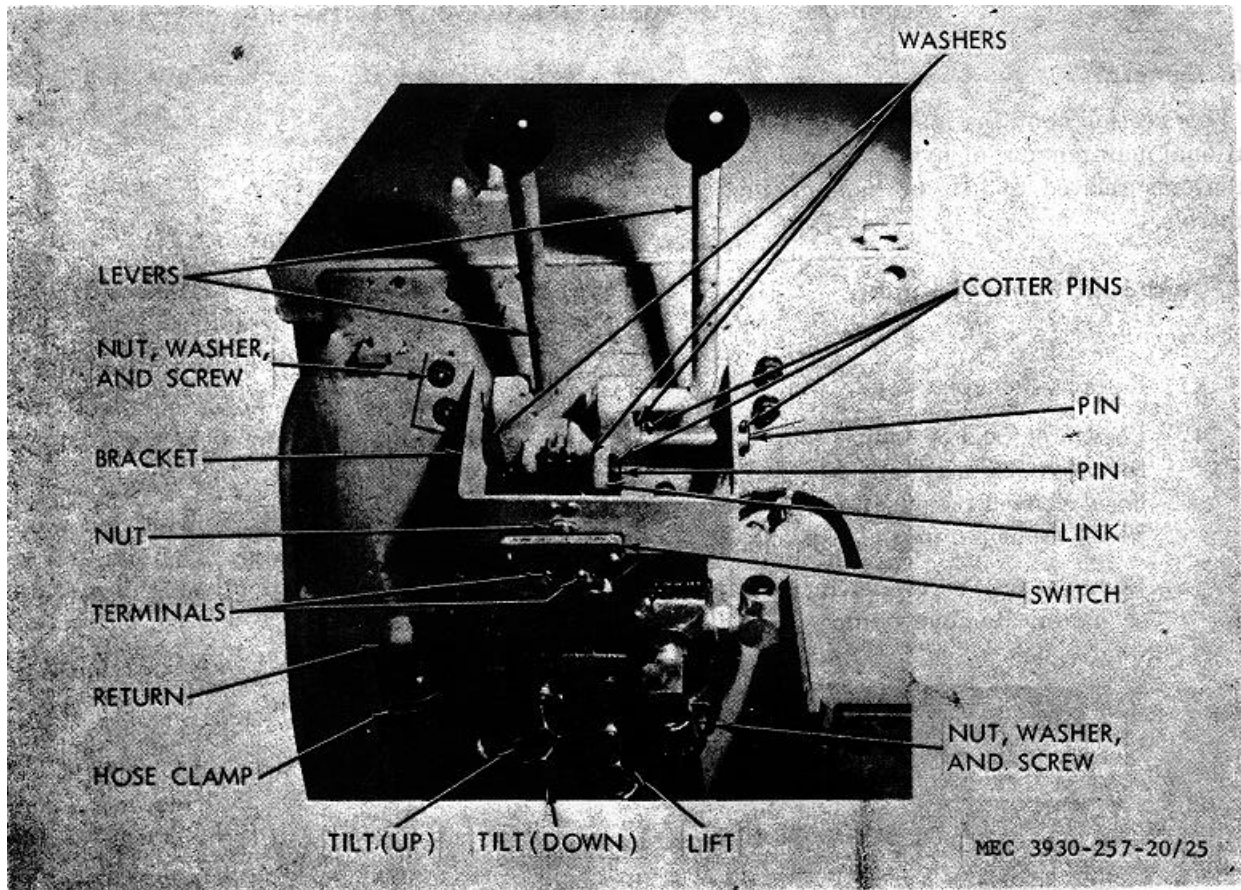


Figure 25. Control valve.

b. *Installation.* Reverse procedures in a above.

59. Control Valve Levers

a. *Removal.*

- (1) Perform procedures in paragraph 58a (1) and (2).
- (2) Remove cotter pins from pin on which handles pivot (fig. 25), withdraw pin, removing three spacer washers as pin is drawn out of levers and bracket.
- (3) Lift off levers.

b. *Installation.* Reverse procedures in a above.

60. Control Valve Bracket

a. *Removal.*

- (1) Remove levers (par. 59a).

- (2) Disconnect leads at switch (fig. 25), loosen nut and turn switch out of bracket.

- (3) Remove nuts, screws, and washers holding bracket to truck and remove bracket.

b. *Installation.* Reverse procedures in a above, turning switch in to point that levers actuate it when operated.

61. Tilt Cylinders

a. *Removal.*

- (1) Disconnect hoses (fig. 26) from tilt cylinder. Cap hoses and plug ports in cylinder to exclude dirt.

- (2) Remove screws, nuts, and washers

attaching plates to brackets on truck frame and on uprights. Remove plates from notches in pins.
(3) Pull or drive pins from brackets

an(d) tilt cylinder ends. Be careful not to let cylinder fall as pins come out.

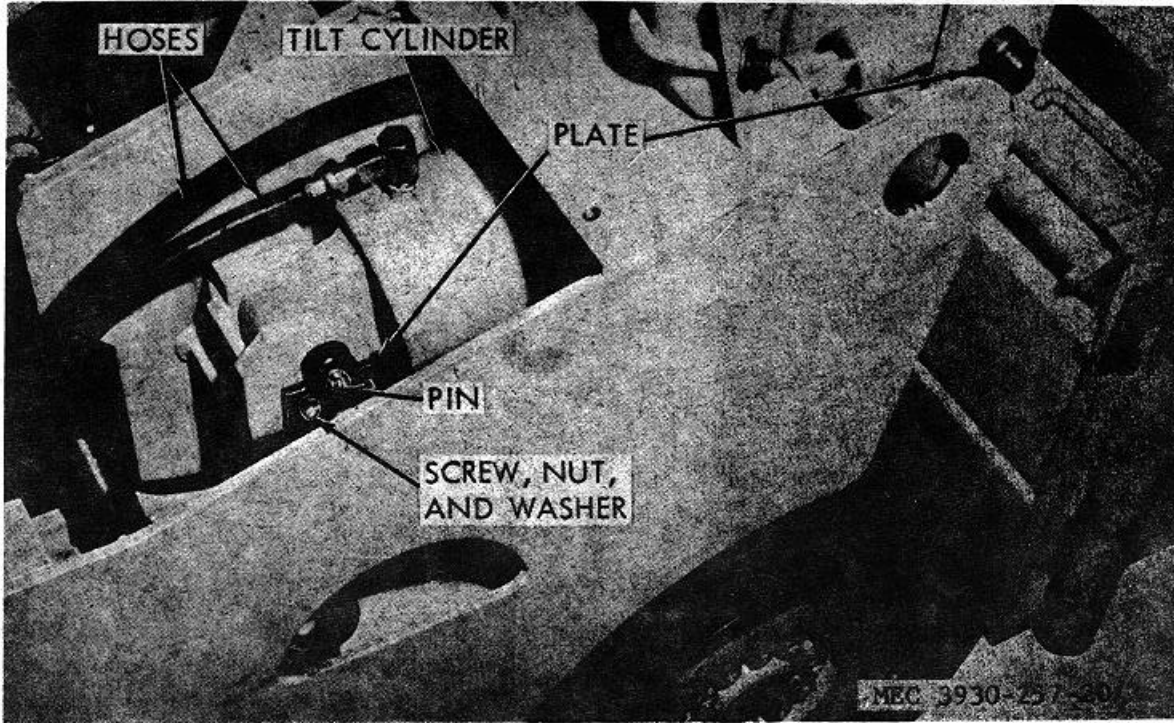


Figure 26. Tilt Cylinder

b. Installation. Reverse procedures in *a* above. After installation, operate tilt control several times to purge air from cylinder. Check cylinder and hose fittings for leakage while operating.

62. Crosshead Rollers

a. Removal.

(1) Lower carriage fully, remove nuts (fig. 27) from chain adjusting screws, and lay chains back out of way.

(2) Remove retaining rings, washers, rollers, and bushings from crosshead.

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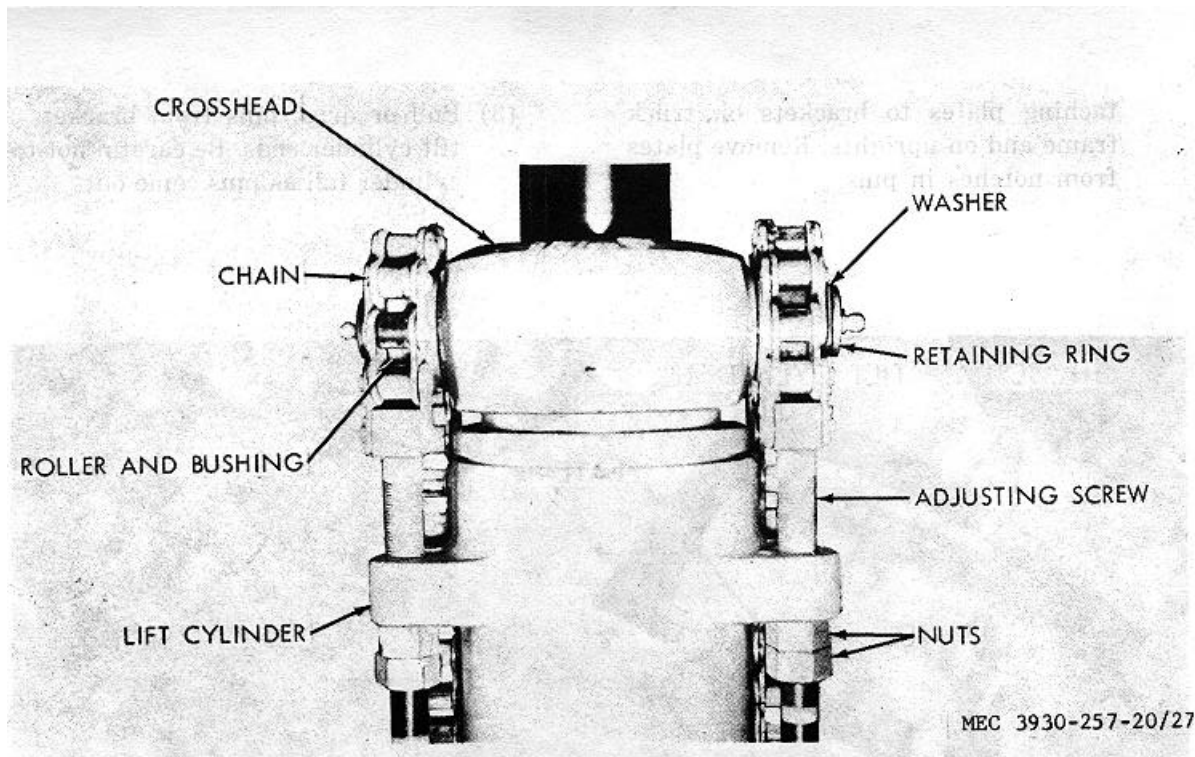


Figure 27. Crosshead, rollers, and chains.

b. Installation.

- (1) Reverse procedures in *a* above.
- (2) Adjust nuts on chain adjusting

screws so each chain begins lifting at same time.

Caution

If load is not shared equally by chains, load will cock crosshead and cause rapid wear and damage to lift cylinder.

63. Chain Assemblies

a. Adjustment. Refer to paragraph 62b(2).

b. Removal.

- (1) Refer to paragraph 62a(1).
- (2) Unhook chains from carriage

assembly.

c. Installation. Reverse procedures in *b* above.

d. Repair. Repair is limited to replacing damaged links.

- (1) Remove chain from truck (*b*

above).

(2) With a chain breaking tool, remove damaged link or links from chain. Failure of one link may damage adjacent links. Remove all damaged links.

(3) Install replacement link and rivet pin end to secure side plates of chain.

Note. Plates of end links are secured by cotter pins. Do not rivet or peen these pins.

64. Forks

a. Removal.

(1) Lower carriage fully, and lift load back rest from carriage (fig. 28).

(2) Lift spacers from carriage. Remove screws, washers, and one plate from carriage. Hold forks and draw shaft from carriage. Forks are now free. Remove them.

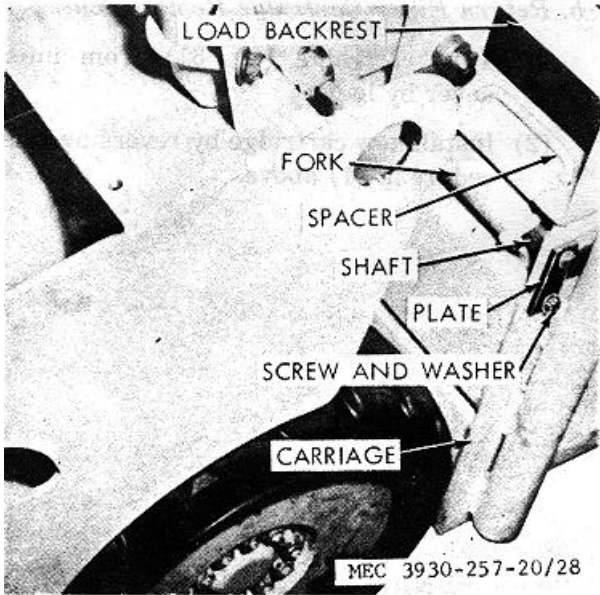


Figure 28. Fork removal.

b. Installation. Reverse procedures in *a* above.

65. Tilt and Lift Cylinder Hoses

a. Removal.

Note. Cap or plug open hoses and ports to exclude dirt.

- (1) Remove floor plate (par. 54).
- (2) Disconnect hoses to be removed at control valve (fig. 25).
- (3) Disconnect tilt cylinder hoses from valve, at tees in lines to tilt cylinders. If these hoses are to be removed, take them off truck at this point.
- (4) Disconnect hoses at tilt cylinders.

Remove nuts and washers holding tee fittings in tilt cylinder lines to bracket (fig. 29) and remove hoses from truck.

- (5) Disconnect lift cylinder hose at flow restrictor (fig. 29) and remove hose.

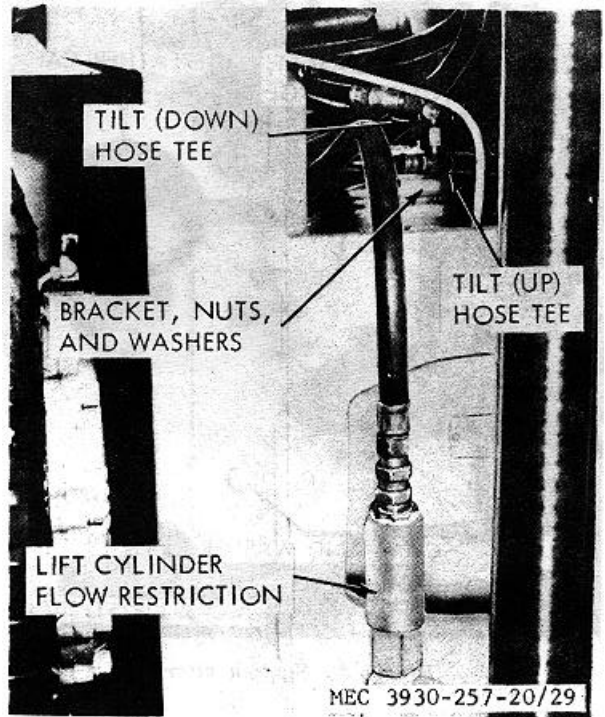


Figure 29. Hose removal.

b. Installation. Reverse procedures in *a* above. Actuate lift and tilt systems for several cycles without load to bleed units of air.

66. Filter Cartridges

Two filters are used in the hydraulic system; one in suction line to pump, within the tank, the other in return line from control valve, at left rear of tank.

a. Suction Filter Cartridge Replacement.

- (1) Remove four screws and washers (fig. 30) and lift off cover and gasket.
- (2) Lift out used cartridge and install new cartridge.
- (3) Reverse procedures in (1) above.

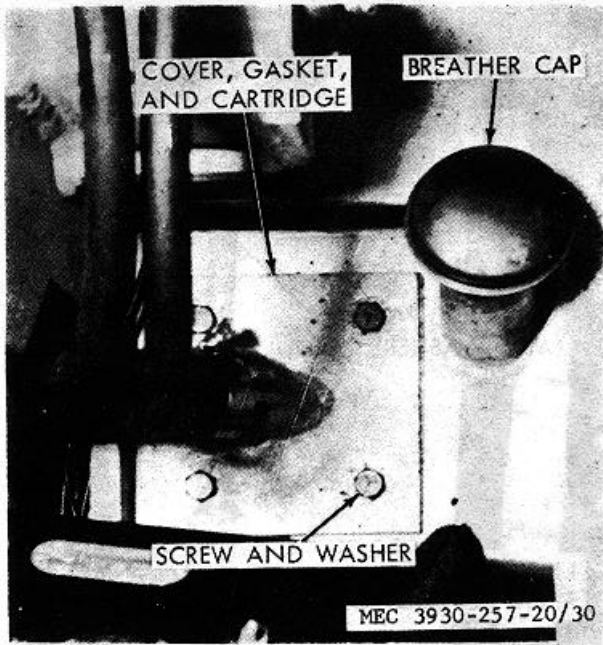
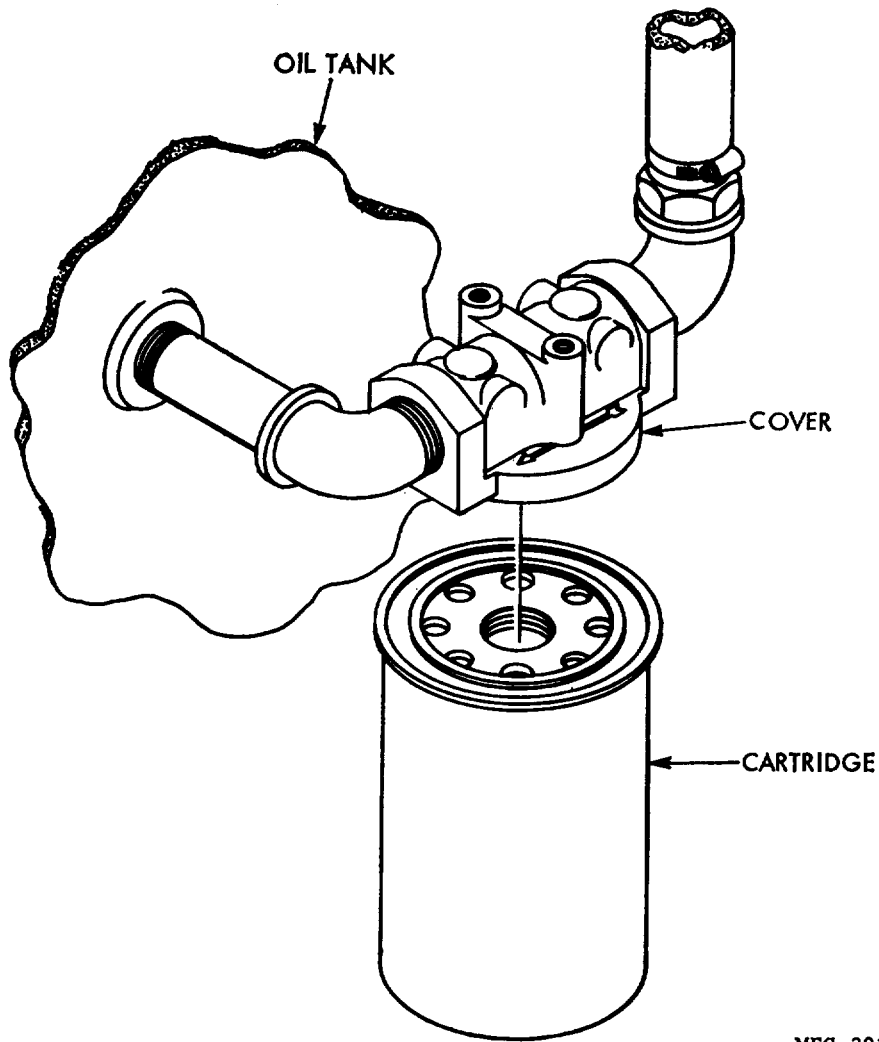


Figure 30. Suction filter.

b. Return Filter Cartridge Replacement.

(1) Turn cartridge (fig. 31) from filter cover by hand.

(2) Install new cartridge by reversing procedure in (1) above



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Figure 31. Return filter.

67. Oil Tank

Service according to LO 10-3930-257-20.

68. Oil Breather Cap

To clean, remove cap (fig. 30), by lifting it off, clean thoroughly with SD, and replace.

Section XII. ELECTRIC MOTORS

69. General

This section contains instructions for the pump motor, power steering motor, and such other electrical items as are within the scope of organizational maintenance.

70. Pump Motor

a. *Removal.*

- (1) Remove floor plate (para. 54).
- (2) Remove pump (para. 57).
Note. Leave hoses connected to pump.
- (3) Disconnect wires at terminals (fig. 32), remove nuts and screws through strap holding motor. Remove screw and clamp (fig. 4) holding thermal

relay to motor and remove thermal relay. Remove motor.

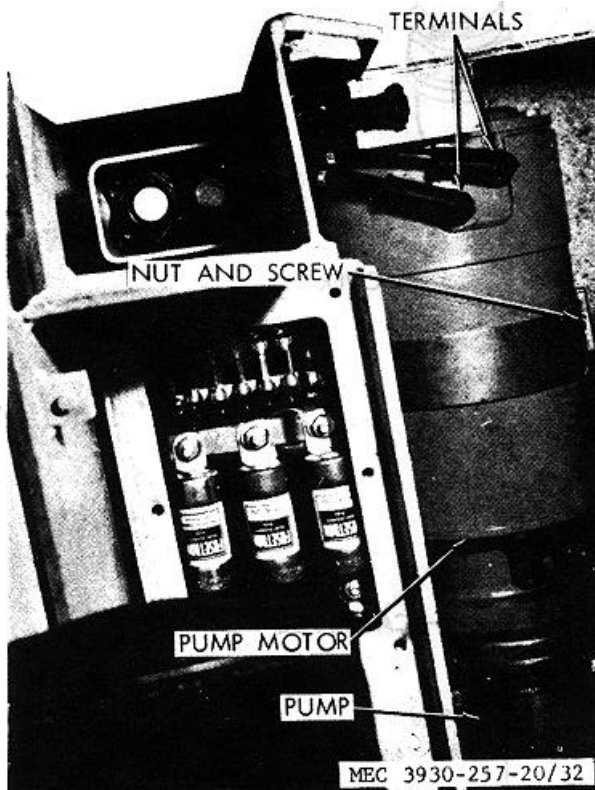


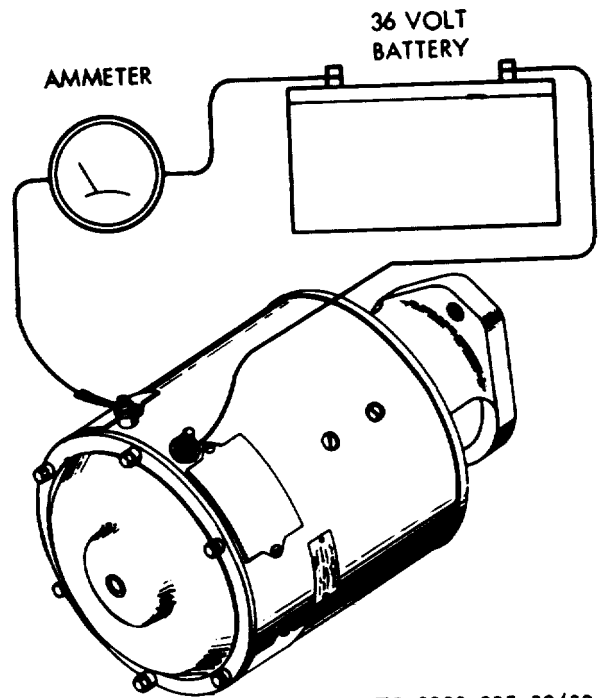
Figure 32. Pump motor.

b. Test.

- (1) With motor removed from truck (or while pump is removed from motor), make connections to motor as shown in figure 33.

Caution. Hold motor securely against starting torque action.

- (2) Note free running current draw of motor. Draw should not exceed 115 amperes at 36 volts. Motor should run freely and quietly.



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Figure 33. Motor test, organizational maintenance.

- c. *Installation.* Reverse procedures in a above.

71. Steering Motor

a. *Removal.*

- (1) Remove pump from motor (par. 46a (2)). Do not remove hoses from pump, but set pump aside so hoses are not stressed.
- (2) Remove screw and clamp (fig. 4) securing thermal relay to motor. Lift off relay.
- (3) Disconnect leads to motor terminals, remove four mounting screws, nuts, and washers at motor base flange, and remove motor.

b. *Test.* Refer to paragraph 70b for procedure. Free running current draw for this motor is 18 amperes at 36 volts.

- c. *Installation.* Reverse procedures in a above.

72. Master or Auxiliary Control Relay Repair

Organizational maintenance of these relays consists only of replacement of contacts, when silver has worn almost down to steel support.

a. Remove cowl (par. 54a(1)), and remove 12 screws securing cover of electrical equipment box (fig. 4).

b. Remove contact to be replaced by removing nut (fig. 34) on that contact and lifting contact free of relay.

c. Install new contact by reversing procedures in b and a above.

73. Accelerator Master Assembly

a. *Removal.*

- (1) Disconnect linkage from operating lever (fig. 35), remove cover screws, and remove cover.
- (2) Disconnect leads inside housing at switch terminal screws (fig. 36). Carefully draw leads out through conduit fitting. Do not remove identification labels from leads.
- (3) Remove screws holding base of housing to truck and remove assembly.

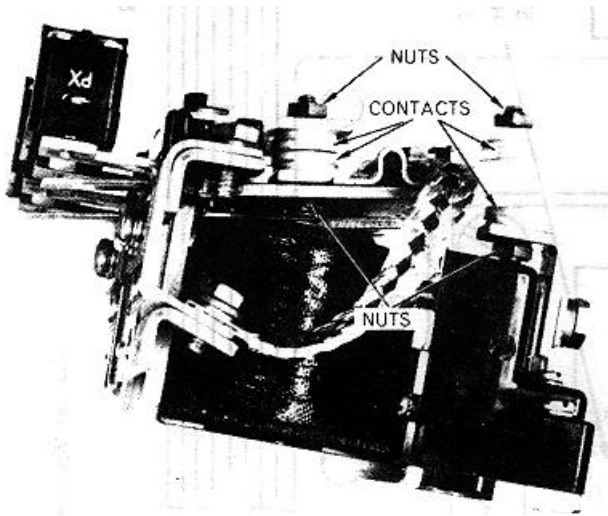


Figure 34. Contact replacement.

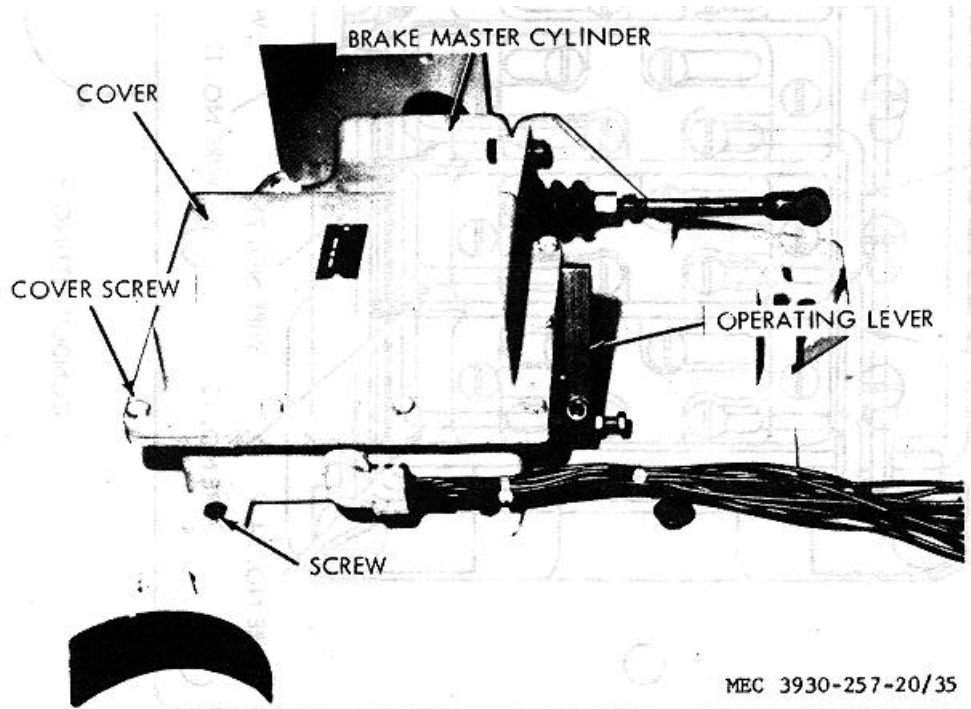
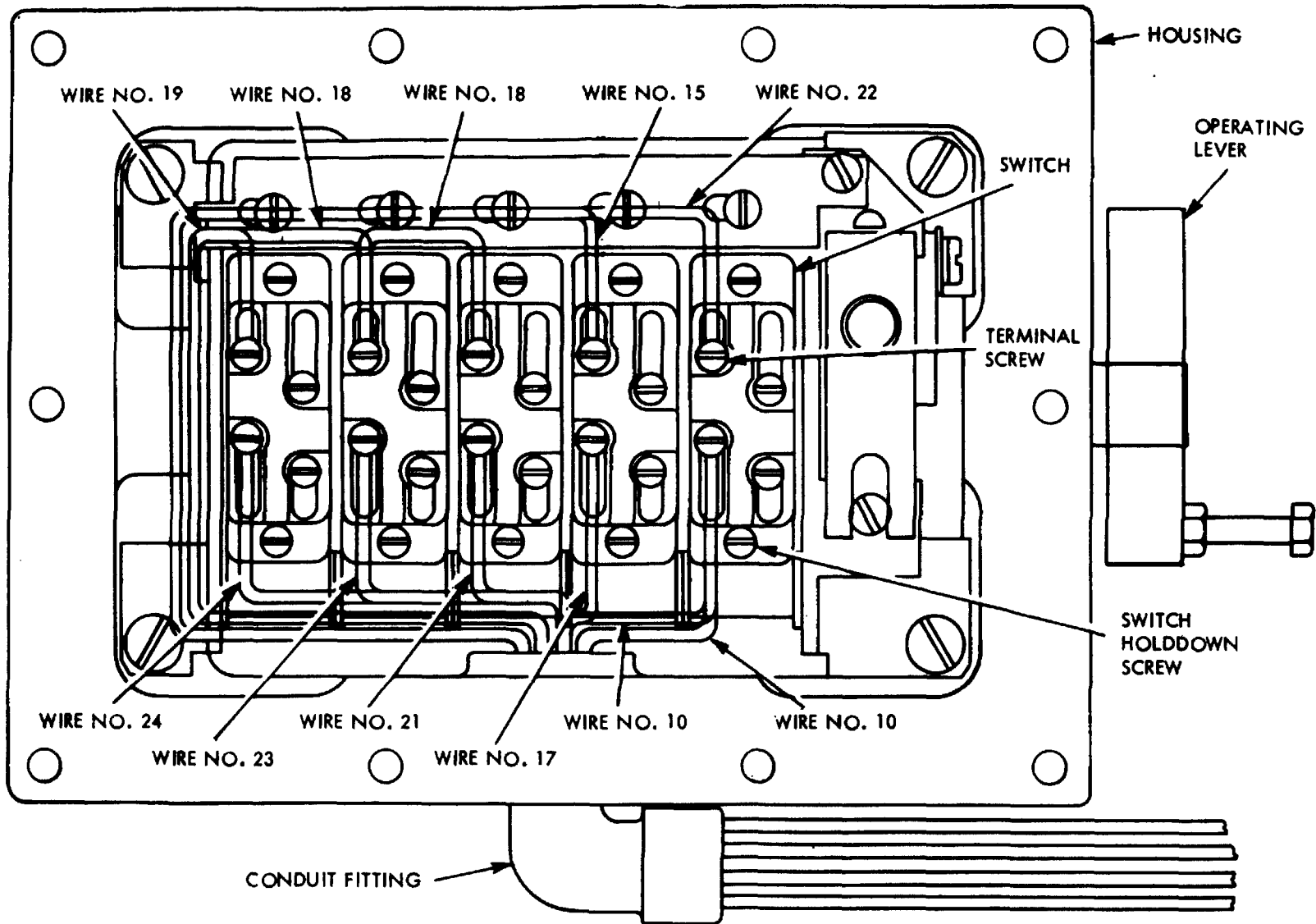


Figure 35. Accelerator master assembly, installed.



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Figure 36. Accelerator master assembly, interior view.

b. Repair. The following procedure does not require removal of the assembly.

- (1) Remove truck floor plate (par. 54).
- (2) Remove cover screws and cover (fig. 35).
- (3) Disconnect leads at switch to be replaced, remove switch holddown screws, and remove switch.
- (4) Install new switch by reversing procedures in (1) through (3) above.

c. *Installation.* Reverse procedures in a above, dressing leads neatly as shown in figure 36. Connect leads according to numbers, in arrangement illustrated in figure 36.

74. Fusetrons

a. *Removal.*

- (1) Remove hood (par. 54a(1)).
- (2) Remove screws and cover plate at top left end of electrical equipment box, to expose fusetrons and fuses (fig. 37).
- (3) Remove nuts at each end of fusetron to be replaced, and remove fusetron.

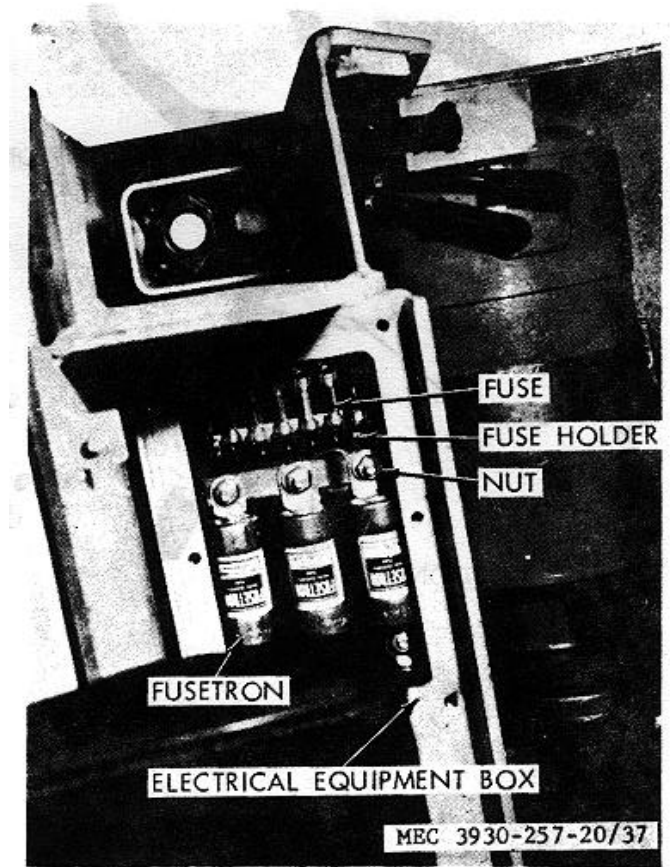


Figure 37. Fusetrons and fuses.

b. *Installation.* Reverse procedures in a above.

75. Fuses

a. *Removal.*

- (1) Refer to paragraph 74a (1) and (2).
- (2) Pull fuse to be replaced straight up from fuse holder.

b. *Installation.* Reverse procedures in a above,

76. Directional Control Switch

a. *Removal.*

- (1) Remove two cover screws and cover (fig. 38). Disconnect and tag leads inside control switch.
- (2) Disconnect conduit at fitting. Draw leads from control switch.
- (3) Remove four clamp screws, clamp, and control switch.

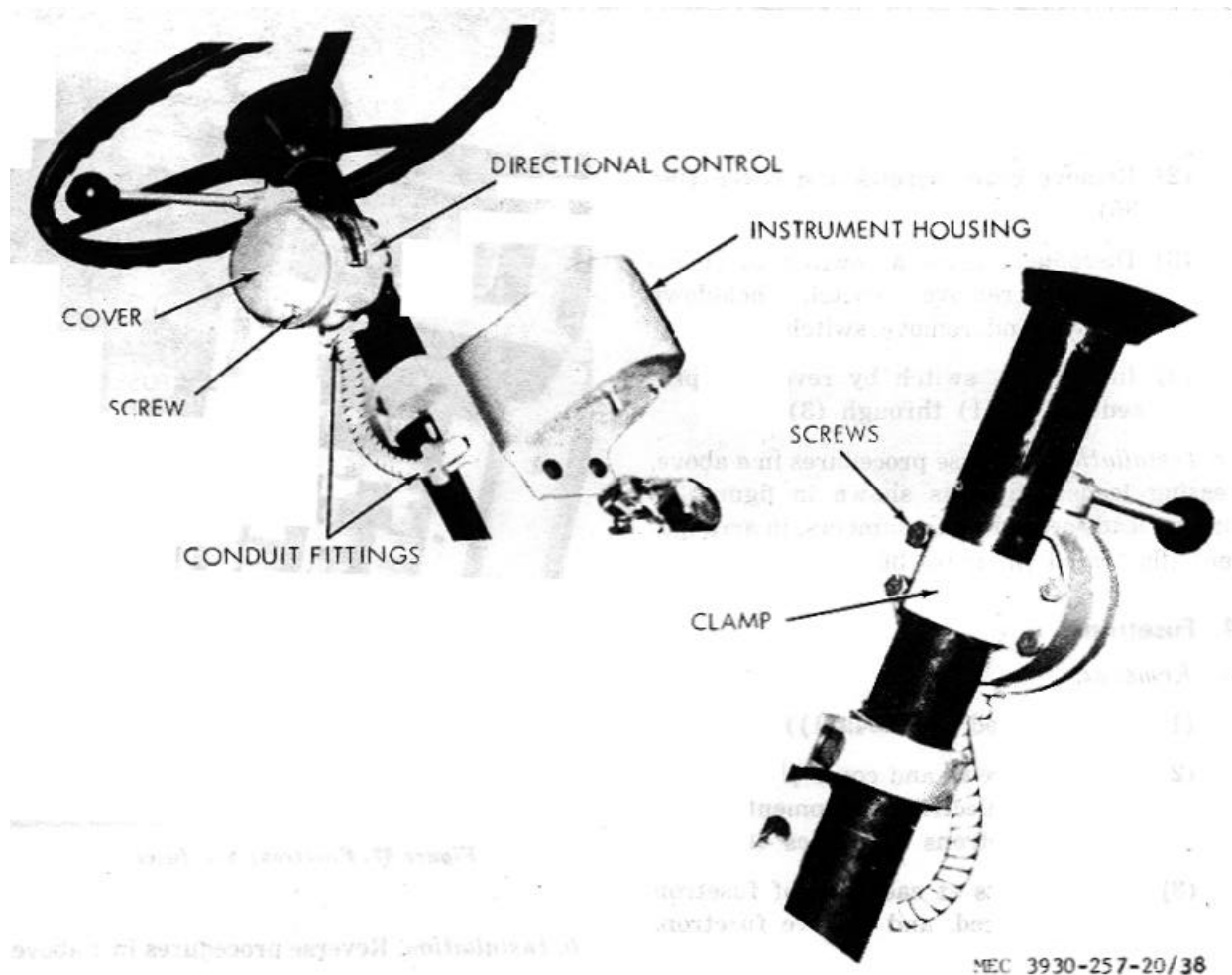


Figure 38. Directional control, right and left views.

b. Installation. Reverse procedures in a above, installing leads to terminals from which they were removed.

77. Pump Motor Switch

a. Removal.

- (1) Remove cowl (para. 54a (1)).
- (2) Disconnect leads at switch (fig. 26), loosen nut, and turn switch out of bracket.

b. Installation. Reverse procedures in a above, turning switch in to point that levers actuate it.

78. Speed Resistor

This is a two part unit with several taps.

a. Test.

- (1) Disconnect and tag leads at resistor taps (fig. 39).
- (2) With ohmmeter, measure resistance between taps for values displayed in figure 40.

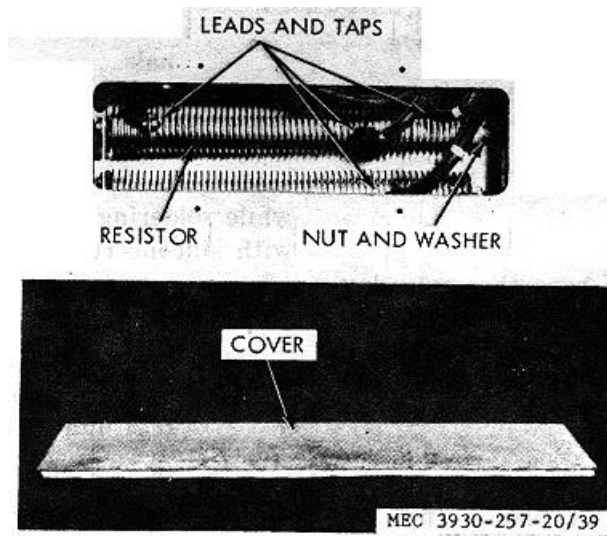
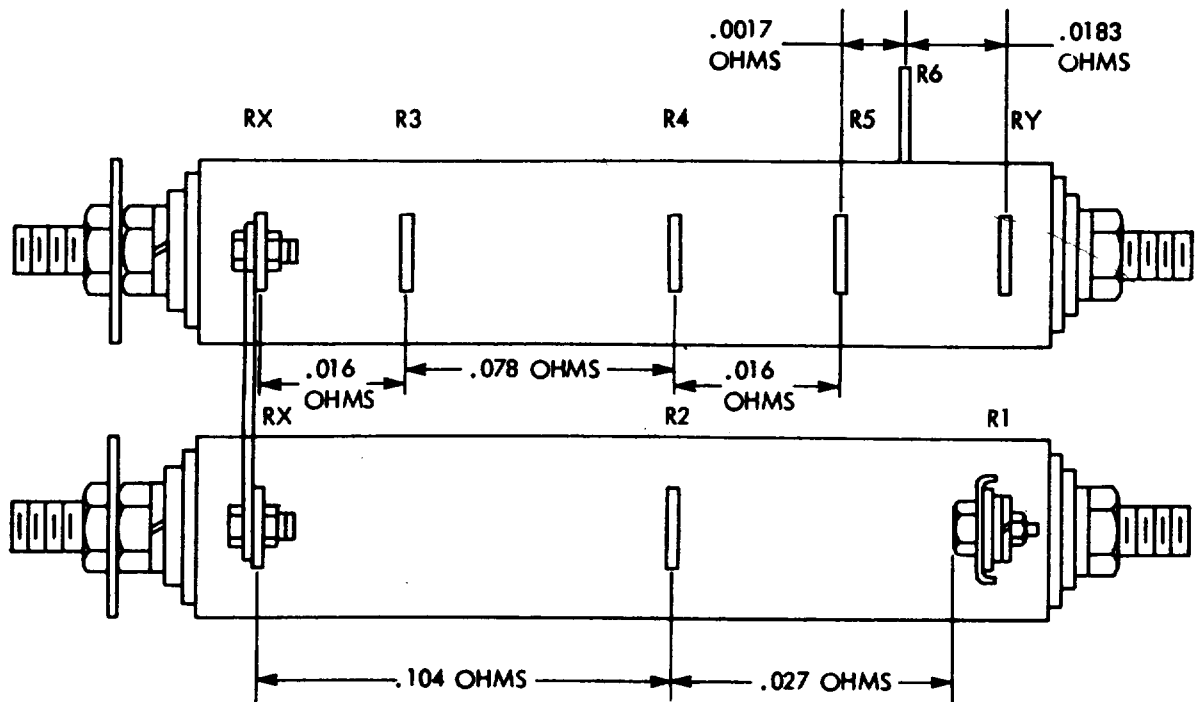


Figure 3.9. Speed resistors, installed.



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Figure 40. Speed resistor test values.

b. Removal.

(1) Perform procedure in a(1) above.

(1) Remove nuts and washers at end of Resistor and lift resistor from truck.

c. Installation. Reverse procedures in b above.

79. Thermal Relay

Each motor is protected by a thermal relay which will open the motor circuit if overheating occurs. When temperature sensed by relay drops to a safe operating value, relay will automatically close.

a. Removal.

(1) Remove screw and clamp (fig. 4) which fastens relay to motor and lift relay from motor.

(2) Scrape sealing compound from relay terminals. Unsolder leads at terminals.

b. Installation. Reverse procedures in a above, soldering leads to terminals with rosin flux and solder. Avoid unnecessary heating of relay while soldering. Coat terminals after soldering with silicone rubber sealing compound.

c. Test.

(1) Test electrical continuity of relay between terminals with an ohmmeter or test light. Test at room temperature.

(2) If controlled temperature is available, test opening temperature of relay. It should open on rising temperature at 224°F., plus or minus 4°.

CHAPTER 4

SHIPMENT AND LIMITED STORAGE

Section I. SHIPMENT WITHIN ZONE OF INTERIOR

80. Preparation of Equipment for Shipment

a. *General.* Detailed instructions for preparation for domestic shipment are outlined within this paragraph. Preservation will be accomplished in sequence that will not require operation of previously preserved components.

b. *Inspection.* Equipment will be inspected for any unusual conditions such as damage, rusting, accumulation of water, and pilferage. Utilize inspection criterion provided on quarterly preventive maintenance services (para. 14), to execute DA Form 2404 on the lift truck, as applicable.

c. *Cleaning and Drying.* Clean and dry lift truck by an approved method. Approved methods of cleaning, drying, types of preservatives, and methods of application are described in TM 38-230.

d. *Painting.* Paint all surfaces where paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instructions.

e. *Sealing of Openings.* Openings that will permit direct entry of water into interior of electric motors will be sealed with pressure sensitive tape conforming to PPP-T-60, type III, class 1.

f. *Hydraulic Control Systems, Except Hydraulic Brakes.*

- (1) Fully retract lift and tilt pistons as far as linkage will permit and secure.
- (2) Coat exposed portions of hydraulic piston rods and operating valve controls with type P-6 preservative conforming to MIL-C-11796, class 3.
- (3) Wrap with type I, class 2, grade A, barrier material conforming to MIL B-121B.

(4) Secure hydraulic operating valve controls in neutral position.

g. *Exterior Surfaces.* Coat exposed machine ferrous metal surfaces with preservative (P-6) conforming to MIL-C-11796, class 3. If preservative is not available, use Automotive and Artillery Grease as specified on lubrication order.

h. *Marking.* Shall conform to MIL-STD129.

i. *Seat Backs and Cushions.* Wrap seat backs and cushions in a waterproof barrier material and seal the seams with type III, class 1, pressure-sensitive tape conforming to PPP-T60.

j. *Batteries and Cables.* The battery will be secured in battery compartment. The battery will be filled and fully charged. Cables will be disconnected, ventholes sealed, and all terminals wrapped and secured with type III, class 1, pressure-sensitive tape conforming to PPP-T60.

k. *Disassembly, Disassembled Parts, and Basic Issue Items.*

- (1) Disassembly will be limited to removal of parts and projecting components that tend to increase the overall profile of the equipment and that which is subject to pilferage.
- (2) Disassembled items will be packed with the publications, in a suitable container and secured to equipment to prevent loss or pilferage. Refer to TM 38-230 for selection and fabrication of containers.
- (3) Forks will be detached and securely strapped to the mast or other suitable part of the truck in such a manner as not to cause damage or increase the

cube unnecessarily. Flat steel strapping not less than 1 1/4 inch by 0.035 inch will be used.

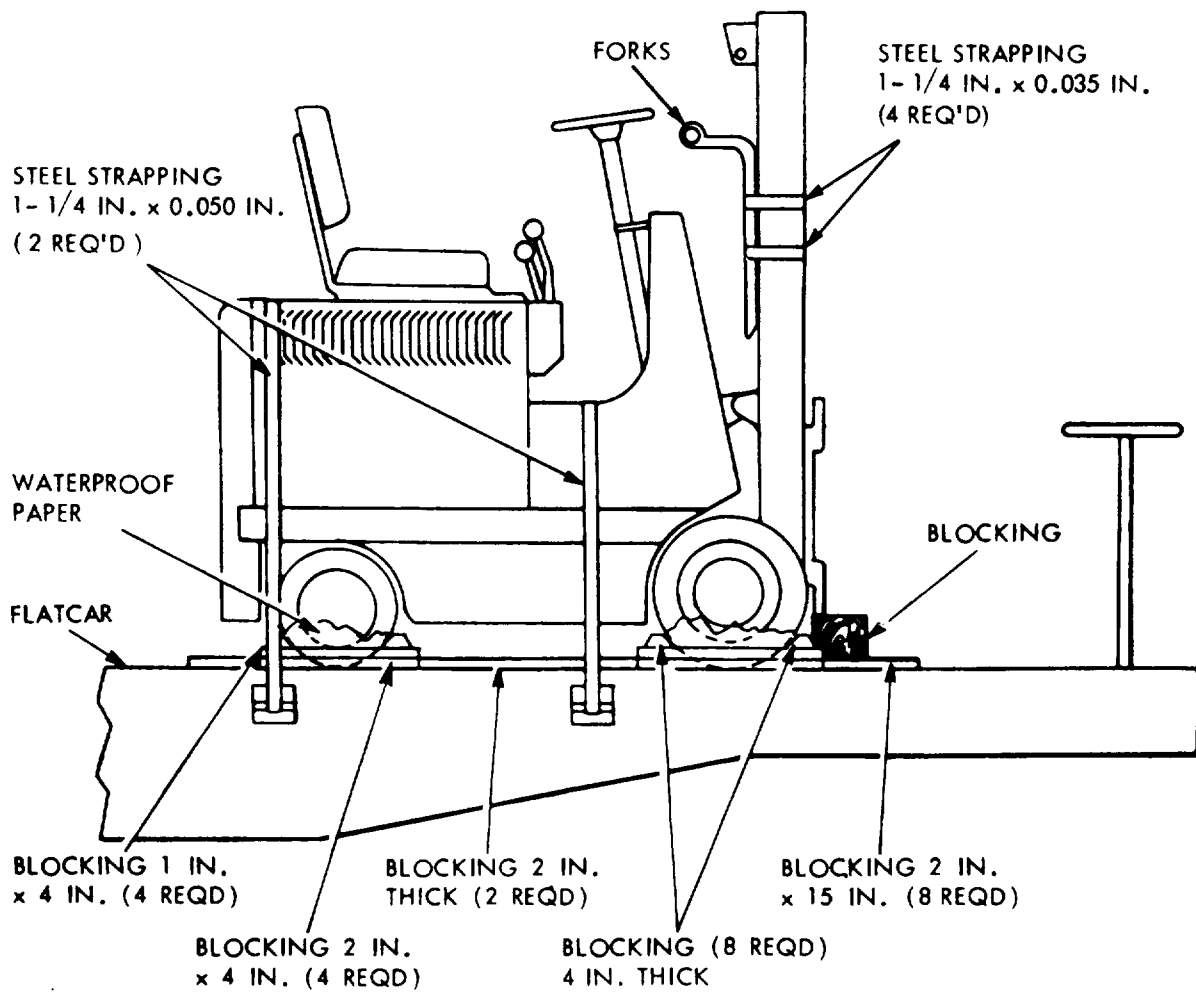
81. Loading Equipment for Shipment, Rail or Truck

This paragraph outlines requirements for loading and blocking truck. A flat car is illustrated; however, if shipment is by truck or box car, adapt these instructions to suit carrying vehicle with no more than essential deviations.

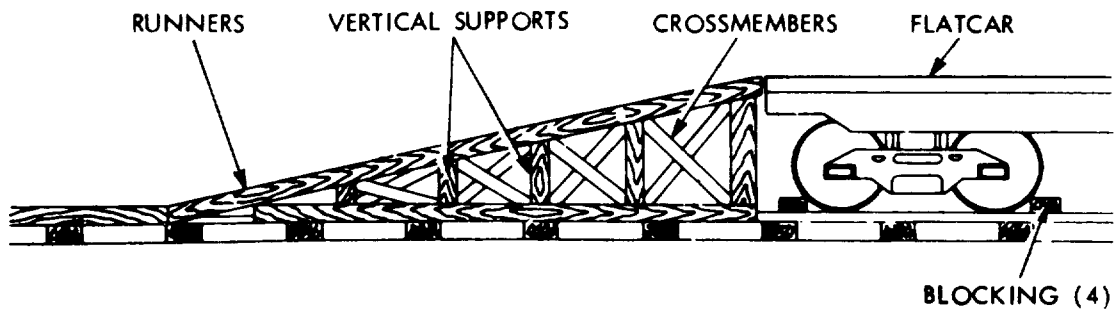
a. Loading.

- (1) Lift truck onto flat car with a hoist rated at 4 tons or greater, or—
- (2) Construct a ramp as shown in figure 41 and drive or pull truck up ramp.

Caution. Be very careful about tipping on ramp.



A. BLOCKING, STRAPPING, AND TIEDOWN



B. LOADING RAMP

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Figure 41. Loading truck for shipment.

- b. *Blocking.* Block, strap, and tie down truck as shown in figure 41.

Section II. LIMITED STORAGE

82. Preparation of Equipment for Limited Storage

a. *General.* Detailed instructions for preserving and maintaining equipment in limited storage are outlined in this paragraph. Limited storage is defined as storage not to exceed 6 months. Refer to AR 743-505.

b. *Inspection.* Equipment will be inspected for any unusual conditions such as damage, rusting, accumulation of water, and pilferage. Utilize inspection criterion provided on quarterly preventive maintenance services (para. 14) to execute DA Form 2404 on the lift truck, as applicable.

c. *Cleaning and Drying.* Clean and dry lift truck by an approved method. Approved methods of cleaning, drying, types of preservatives, and methods of application are described in TM 38-230.

d. *Painting.* Paint all surfaces where paint has been removed or damaged. Refer to TM 9-213 for detailed cleaning and painting instructions.

e. *Sealing of Openings.* Openings that will permit direct entry of water into interior of electric motors will be sealed with pressure sensitive tape, conforming to PPP-T-60, type III, class 1.

f. *Hydraulic Control Systems, Except Hydraulic Brakes.*

- (1) Fully retract piston as far as linkage will permit and secure.
- (2) Coat exposed portions of hydraulic piston rods and operating valve controls with type P-6 preservative conforming to MI-C-11796, class 3.
- (3) Wrap with type I, class 2, grade A, barrier material conforming to MIL B-121B.

g. *Exterior Surfaces.* Coat exposed machine ferrous metal surfaces with preservative (P-6)

conforming to MIL-C-11796, class 3. If preservative is not available, use Automotive and Artillery Grease as specified on the lubrication order.

h. *Seat Backs and Cushions.* Wrap seat backs and cushions in a waterproof barrier material and seal the seams with type III, class 1, pressure-sensitive tape conforming to PPP-T60.

i. *Batteries and Cables.* The battery will be secured in battery compartment. The battery will be filled and fully charged. Cables will be disconnected, ventholes sealed, and all terminals wrapped and secured with type III, class 1, pressure-sensitive tape conforming to PPP-T60.

j. *Disassembly, Disassembled Parts, and Basic Issue Items.*

(1) Disassembly will be limited to removal of parts and projecting components that tend to increase the overall profile of the equipment and that which is subject to pilferage.

(2) Disassembled items will be packed with the publications in a suitable container and secured to equipment to prevent loss or pilferage. Refer to TM 38-230 for selection and fabrication of containers.

k. *Weatherproofing.* Warehouse storage is preferred for the lift truck. If this is not available, select a firm, level, well-drained location.

Place lift truck on heavy planking or other solid surface. Cover lift truck with a tarpaulin or other waterproof material and tie down securely.

83. Inspection and Maintenance of Equipment in Storage

a. *Inspection.* When equipment has been placed in limited storage all scheduled preventive maintenance services, including inspection,

will be suspended and preventive maintenance inspection will be performed as specified herein. Refer to AR 743-505.

b. Worksheet and Preventive Maintenance. Applicable forms listed in TM 38-750 will be prepared for each major item of equipment every 90 days while in limited storage. Perform required maintenance

promptly to make sure equipment is mechanically sound and ready for immediate use.

c. Operation. Operate equipment in limited storage long enough to insure complete lubrication of all bearings, gears, and the like, every 90 days. Equipment must be serviced and in satisfactory condition before it is operated.

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CHAPTER 5

DEMOLITION OF FORKLIFT TRUCK TO PREVENT ENEMY USE

84. General

When capture or abandonment of the forklift truck to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all forklift trucks and all corresponding repair parts.

85. Demolition To Render Forklift Truck Inoperative

a. Mechanical Means. Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available to destroy the following:

- (1) Contactors.
- (2) Battery.
- (3) Hydraulic motor and steering motor.

Note. The above steps are in minimum requirements for this method.

- (4) Pumps.
- (5) Tilt cylinders.
- (6) Control panel.

b. *Misuse.* Pour sand, dirt, glass, or other abrasives in the oil reservoir and operate the forklift truck until failure occurs. Raise fork to maximum height and continue to hold the lift and tilt control back until failure occurs to the pump or motor.

86. Demolition by Explosives or Weapons Fire

a. *Explosives.* Place as many of the following charges as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator.

- (1) One 1/2-pound charge on the tilt cylinder.
- (2) One 1/2-pound charge on the differential.
- (3) One 1/2-pound charge on the hydraulic pump motor.
- (4) One 1/2-pound charge on the inside of each steering wheel.
- (5) One 1/2-pound charge on the inside of each drive wheel.
- (6) Two 1/2-pound charges on drive motor.
- (7) Two 1/2-pound charges inside battery compartment.
- (8) One 1/2-pound charge inside of control panel.

b. *Weapons Fire.* Fire on the forklift truck with the heaviest practical weapons available.

87. Other Demolition Methods

a. *Burning.* Pack rags, clothing, or canvas, under, around, and inside the forklift truck. Saturate this packing with gasoline, oil, or diesel fuel and ignite.

b. *Submersion.* Totally submerge the forklift truck in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

88. Training

All operators should receive thorough training in the destruction of the forklift truck. (Refer to FM 5-25.) Simulated destruction's, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training, that demolition operations usually are necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.

APPENDIX I

REFERENCES

1. Dictionaries of Terms and Abbreviations

AR 320-5 Dictionary of United States Army Terms.
AR 320-50 Authorized Abbreviations and Brevity Codes.

2. Fire Protection

SB 5-111 Supply of DA Approved Fire Extinguishers to Army Troop Users.
TM 5-687 Repair and Utilities: Fire Protection Equipment and Appliances:
Inspections, Operations, and Preventive Maintenance.

3. Lubrication

LO 10-3930-257-20 Lubrication Order.

4. Painting

TM 9-213 Painting instructions for Field Use.

5. Preventive Maintenance

AR 750-5 Organization, Policies and Responsibilities for Maintenance Operation.
TB ENG 347 Winterization Techniques for Engineer Equipment.
TM 5-764 Electric Motor and Generator Repair.
TM 9-207 Operation and Maintenance of Army Materiel in Extreme Cold
Weather (0° to —65 F.)
TM 9-6140-200-15 Operation and Organizational, Field and Depot Maintenance: Storage
Batteries, Lead-Acid Type.
TM 38-750 Army Equipment Record Procedures.

6. Publication Indexes

DA Pam 108-1 Index of Army Motion Pictures, Film Strips, Slides, Tapes, and
Phono-Recordings.
DA Pam 310-1 Index of Administrative Publications.
DA Pam 310-2 Index of Blank Forms.
DA Pam 310-3 Index of Doctrinal Training, and Organizational Publications.
DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Manuals
(Types 4, 6, 7, 8, and 9), Supply Bulletins, Lubrication Orders,
and Modification Work Orders.
DA Pam 310-5 Index of Graphic Training Aids and Devices.
DA Pam 310-25 Index of Supply Manuals- Corps of Engineers.

7. Radio Interference Suppression

TM 11-483 Radio Interference Suppression.

8. Shipment and Limited Storage

AR 743-505
TM 38-230

Limited Storage of Corps of Engineers Mechanical Equipment.
Preservation, Packaging, and Packing of Military Supplies and
Equipment.

9. Supply Publications

FSC C9100-IL
TM 10-3930-257-20P

Fuels, Lubricants, Oils, and Waxes.
Organizational Maintenance Repair Parts and Special Tool List.

10. Training Aids

FM 5-25
FM 21-5
FM 21-6
FM 2130

Explosive and Demolition's.
Military Training.
Techniques of Military Instruction.
Military Symbols.

APPENDIX II

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

1. General

This appendix contains the explanations of all the maintenance and repair functions authorized the various maintenance levels.

2. Maintenance Operations

Maintenance is any action taken to keep material in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of material includes the following:

a. Service. Operations required periodically to keep the item in proper operating condition, i.e., to clean, preserve, drain, paint, and replenish fuel, lubricants, hydraulic and deicing fluids or compressed air supplies.

b. Adjust. Regulate periodically to prevent malfunction. Adjustments will be made commensurate with adjustment procedures and associated equipment specifications.

c. Aline. Adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized or adjusted.

d. Calibrate. Determine, check, or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.

e. Inspect. Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.

f. Test. Verify serviceability and detect incipient electrical or mechanical failure by measuring the mechanical or electrical characteristics of the item and comparing these characteristics with authorized standards. Test will be made commensurate with test procedures and with calibrated tools and/or test equipment referenced on the MAC.

g. Replace. Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts or remove and install

the same item when required for the performance of other maintenance operations.

h. Repair. Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills to include welding, grinding, riveting, straightening, adjusting, and facing.

i. Overhaul. Restore an end item to completely serviceable condition as prescribed by serviceability standards developed and published by national maintenance points having maintenance responsibility for the item. This is accomplished through employment of the technique of "inspection and repair only as necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul, "overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items, is limited to depot maintenance level.

j. Rebuild. Restore to a condition comparable to new, by disassembling to determine the condition of each component part and reassembly using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

3.Explanation of Columns

a. Functional Group Number. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1 Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes normally are set up in accordance with their function and proximity to each other.

b. Component Assembly Nomenclature. This column contains the functional grouping index

heading, subgroups heading, and a brief description of the part starting with the noun name.

c. Essentiality. The essentiality column reflects whether or not an assembly, or repair part, is combat essential to the tactical use of the end item. The letter E in this column indicates the items are combat essential.

d. Maintenance Operations and Maintenance Levels. This column contains the various maintenance operations A through J, service, adjust, etc. A symbol indicating the maintenance level placed in the appropriate column in line with an indicated maintenance operation authorizes that level to perform the function. The symbol indicates the lowest level of

maintenance responsible for performing the function, but does not necessarily indicate repair parts stockage at that level. Higher levels of maintenance are authorized to perform the indicated functions of lower levels. The symbol designations for the various maintenance levels are as follows:

- O/C —Operator or Crew
- O —Organizational
- DS —Direct Support
- GS —General Support
- D —Depot

Section II. MAINTENANCE ALLOCATION CHART

FUNCTIONAL GROUP NO.	FUNCTIONAL GROUP	E S S E N T I A L I T Y	Maintenance operations and maintenance levels																	
			A	B	C	D	E	F	G	H	I	J								
			S E R V I C E	A D J U S T	A L I N E	C A L I B R A T E	I N S P E C T	T E S T	R E P L A C E	R E P A I R	O V E R H A U L	R E B U I L D								
06	ELECTRICAL SYSTEM.																			
0607	Instrument Panel: Hourmeter							0		0										
0608	Miscellaneous Items: Switch, stop light							0		0										
0609	Lights: Headlight Light, tail and stop Resistors, light										0	0	0	0						
0610	Horn: Horn									0		0								
0612	Batteries: Batteries									0		0								
0613	Hull or Chassis Wiring Harness: Wiring, head, tail, stop light											DS	0							
10	FRONT AXLE.																			
1000	Front Axle Assembly: Power axle assembly							0				DS	DS	GS						
1002	Differential: Differential and drive gear											DS	GS							
11	REAR AXLE.																			
1100	Rear Axle Assembly: Axle assembly, steering										0	DS	DS							
1104	Steering: Knuckle, steering							0				0								
12	BRAKES.																			
1201	Hand Brakes: Cable, brake																			
1202	Service Brakes: Brake assembly											0	0							
1204	Hydraulic Brake System: Master cylinder Wheel cylinder assembly							0				0	DS	DS						
13	WHEEL.																			
1311	Wheel Assembly: Bearings, wheel, rear 0.							0				0								
14	STEERING.																			
1401	Steering Assembly: Steering gear assembly							0	0			DS	DS							
1410	Hydraulic Pump: Pump assembly, steering:											0	DS							
1413	Tanks, Reservoirs: Reservoir							0				DS								
1806	Seats: Seat assembly											0	0							
24	HYDRAULIC LIFT COMPONENTS.																			
2401	Hydraulic Pump: Pump assembly, hydraulic											0	DS							
2402	Hydraulic Control Valve: Valve, control											0	DS							
2404	Hydraulic Tilt Cylinders: Cylinder assembly, tilt											0	DS							

FUNCTIONAL GROUP NO.	COMPONENT ASSEMBLY NOMENCLATURE	E S S E N T I A L I T Y	Maintenance operations and maintenance levels										
			A	B	C	D	E	F	G	H	I	J	
			S E R V I C E	A D J U S T	A L I N E	C A L I B R A T E	I N S P E C T	T E S T	R E P L A C E	R E P A I R	O V E R H A U L	R E B U I L D	
2405	Hydraulic Mast Column: Cylinder, hoist Chain assembly			0						DS O	DS O		
2406	Hydraulic Lines and Fittings: Tank, oil Cap, oil breather		0 O/C							DS O			
40	ELECTRIC MOTORS.												
4000	Motor:												
	Motor, travel							DS	DS	DS	DS	GS	
	Motor, pump								O	O	DS		
	Motor, steering								O	O	DS		
4001	Motor Assemblies:												
	Armature, travel motor								DS	DS	DS	DS	
	Armature, pump motor								DS	DS	DS	DS	
	Armature, steering pump motor								DS	DS	DS	DS	
4002	Stator Assemblies:												
	Coils, field, travel motor								DS	DS	DS	DS	
	Coil assembly, field, pump motor								DS	DS	DS	DS	
	Frame and field assembly, steering pump motor								DS	DS	DS	DS	
4010	Master or Auxiliary Control Assembly:												
	Contactors									DS	O	O	
	Accelerator master assembly									O	O		
4012	Switches:												
	Switch, directional									O	DS		
4014	Resistors:												
	Resistors, speed									O	O		
4015	Relay or Assembly:												
	Thermal relay									O	O		
76	FIRE FIGHTING EQUIPMENT COMPONENTS.												
7603	Extinguisher, Fire								O/C		O/C		

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NG: State AG (3).

USAR: None.

For explanation of abbreviations used, see AR 320-50.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 decagram = 10 grams = .35 ounce
 1 hectogram = 10 decagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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